The Electrical Industry's Weekly Magazine

June 23, 1958

Electrical World

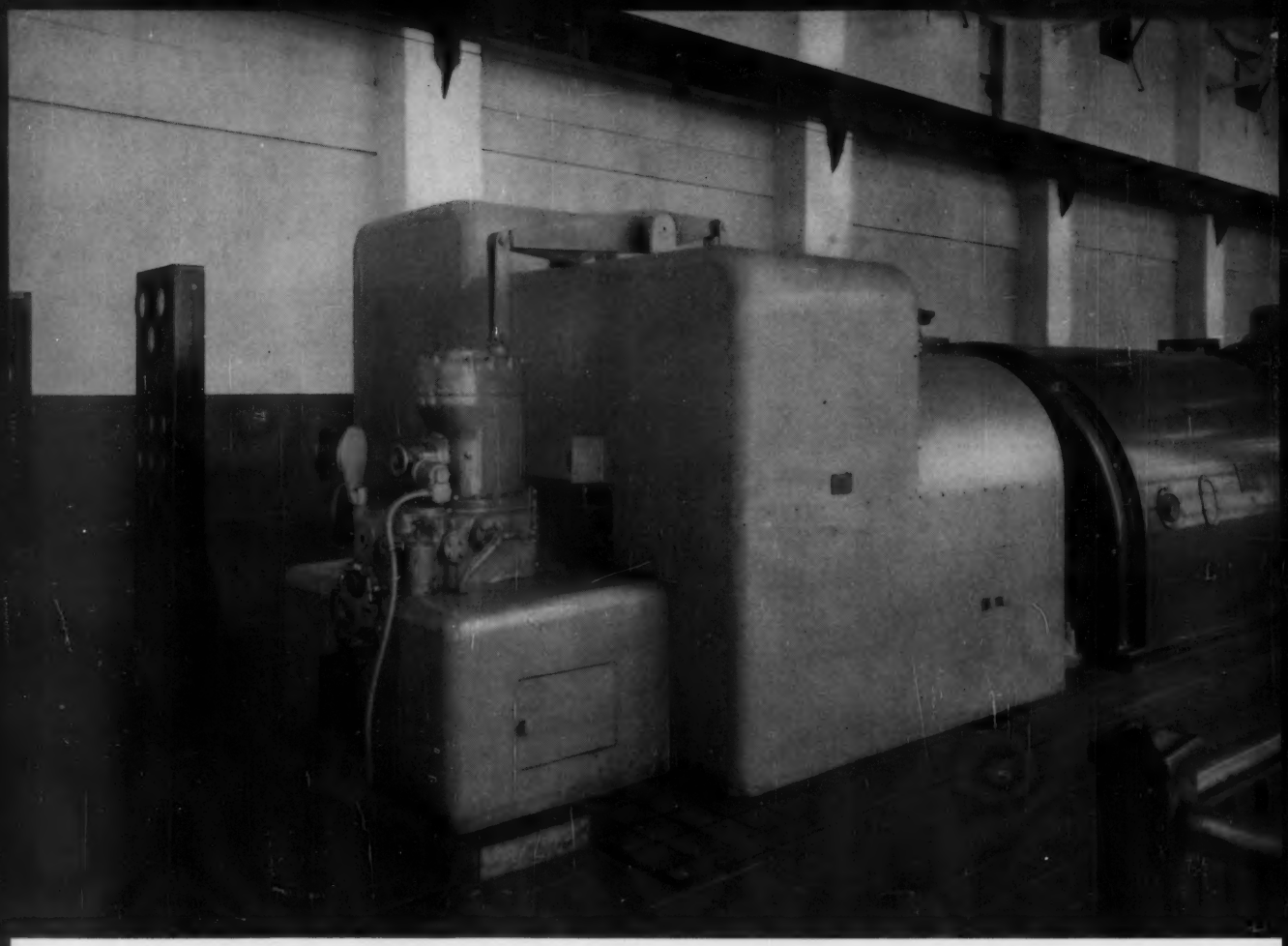
Price 50 Cents

A McGraw-Hill Publication

Here's EEI's new President, Jack Corette, Montana Power Company

"Power Is Our Business"

Is Theme of 26th Annual EEI Convention . . . p 85



Triple threat to rust, oxidation and foam:

TEXACO REGAL OIL R&O

Here's an oil that "takes care of itself"—and your turbine—by resisting oxidation, preventing rust and foam. Texaco Regal Oil R&O keeps bearings running cool and smooth, keeps the governor accurate and responsive, keeps maintenance costs down—because it resists the effects of entrained air and water, has an extra-long service life.

To make sure Texaco Regal Oil R&O gives you this kind of protection, Texaco takes select base stocks and carefully refines them to remove the unstable components that lead to oxidation and sludge formation. The addition of anti-oxidants and a foam-depressant further stabilizes the oil. Rust inhibitors keep the oiling system free of corrosion.

There is a complete line of Texaco Regal Oils R&O to meet the requirements of any size or type of turbine. A Texaco Lubrication Engineer will be glad to help you select the right one for your equipment.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

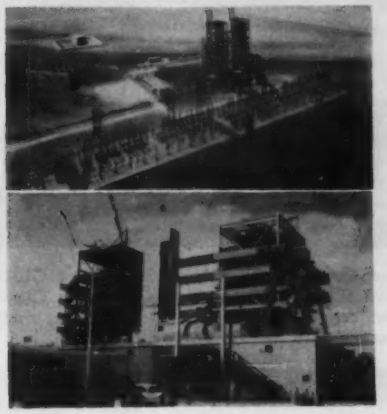
(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

Electrical World

Vol. 149, No. 25 JUNE 23, 1958

Published for 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue



p 82

CURRENT EVENTS

Rate Hikes Pose Problems

Applications for rate increases bear added resistance factor of recession worries and election year.....p 78

Arizona Agreement Pays Off

Two contracts replace many as Arizona PS Co and Salt River PD agree on boundaries, joint operations.....p 82

MANAGEMENT NEWSLETTER

Has the Recession Hit Bottom?

May's business statistics offer more encouragement than those for any month since recession began.....p 187

A Staff Report

p 85

26th ANNUAL EEI CONVENTION

Convention Theme: "Power Is Our Business"

Full-length interview with new EEI President Jack E. Corette leads off the 16-page report on the EEI convention held in Boston earlier this month. You'll find excerpts and summaries of all major speeches given before the largest electric company meeting of the year.....p 85

Departments

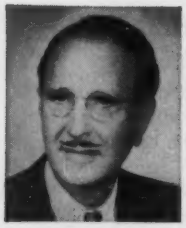
Books 173
Editorials 77
• Electrical Week 19
Executive Reader 22
From the Publisher 5
How To 102
• Management Newsletter ..187
Manufacturers News..108, 155
Meetings Calendar 210
Meeting Reports 84
New Equipment 160
New Literature 168
News About People 196
Selling 180

INDEX TO ADVERTISERS...210

Soggy land and heavy reels of Okonite Cable presented a rugged installation problem. But by digging a 4-foot trench, and by "putting the Cat before the truck before the float," Guarantee Electrical Co. laid down two cables simultaneously at three miles per hour. Cables were a 15kv, 3-conductor Okolite-Okoprene submarine power cable and a 24-conductor Okolite-Okoprene submarine control cable designed to assure the continuous water supply essential to plant operation.

"We specified Okonite because...

This tough installation called for top-quality cables to assure continuous plant operation"



"Demanding assignments are 'our meat'," says Arthur Kaspar, Chief Electrical Engineer of Guarantee Electrical Company of St. Louis. "A good example is our recent cable installation for a large plant here in Missouri.

"Our client specified a never-failing, 24-hour-a-day, controlled source of plant water. The best pumping station site was miles from the plant, in low-water marsh land subject to periodic flooding from the Mississippi River—up to 25 feet above river level. One thing was certain . . . this called for really dependable cables for power and for control of the complex pumping station that would supply the water to the plant.

"Another thing was certain, too . . . this was a job for Okonite. Our experience has taught us that Okonite gives maximum insurance and value where dependability in vital circuits is concerned."

Conferences between Mr. Kaspar and Okonite developed the proper cables: unaffected by water, highly resistant to soil conditions and other factors that attack *any* buried or submerged cable, and backed up by Okonite's 78 years of making highest-quality cable.

* * *

For your vital circuits, take a tip from Mr. Kaspar and other leading electrical engineers and specify Okonite. Whatever the installation, when you talk to Okonite you'll get an unprejudiced recommendation for your cable needs because Okonite, *and only Okonite*, makes cable by all four insulating methods: strip, dip, extrusion and taping. The Okonite Company, Passaic, New Jersey.

5248

where there's electrical power...there's **OKONITE CABLE**

The Advertising Program

Speaking before the convention of the Edison Electric Institute in Boston, Alan S. Boyd, Chairman of the Florida Railroad and Public Utilities Commission criticized the utilities' advertising program rather severely. He said, "I am no expert in evaluating advertising but what I have seen of this program to date strikes me as similar to an attempt to sell oranges by stating what is wrong with apples."

Mr. Boyd went on to say that he did not believe the investor-owned electric industry had gained new support through the use of the advertising program which he believes is wasted when approached from the negative viewpoint. "Who cares" he bluntly asked, "that you pay taxes which in turn are used to support and expand your competitors?"

Now this criticism may be very valuable so long as it is not used as an excuse by some to reduce their support. Commissioner Boyd did not suggest abandoning the program. He supports the idea. He was only referring to a few ads that use the negative approach.

We think most people will agree with him that the power companies should sell their advantages, not the other fellow's faults. On the other hand, we believe it to be management's prerogative to decide upon advertising copy.

Fischer Black

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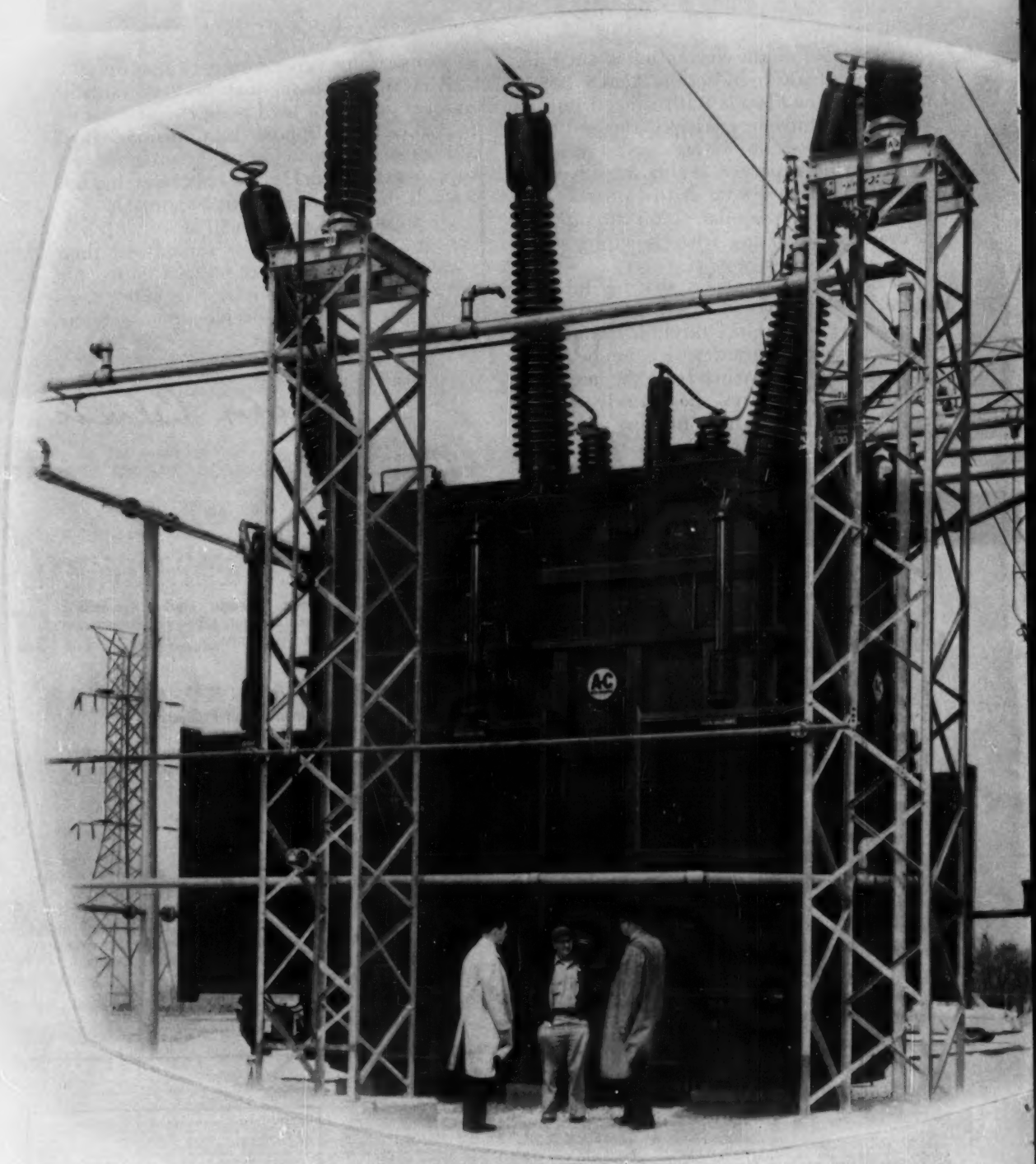
An example of Allis-Chalmers



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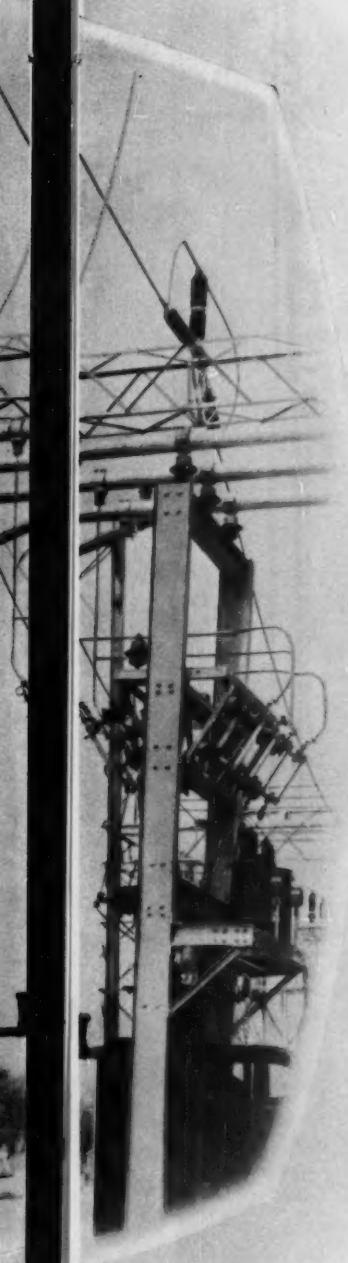
leadership in transformers



345,000-Volt Autotransformers for Commonwealth Edison Company

ONE of two 180,000-kva transformers recently installed at the Goodings Grove substation is shown. These units will interconnect and permit the exchange of electric power between Commonwealth Edison and the American Electric Power Company (formerly the American Gas and Electric Company).

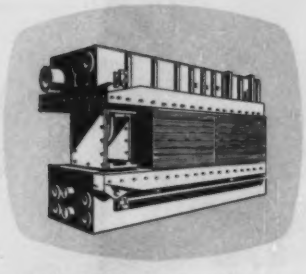
Features of these units of interest to engineers are:

- BIL is reduced two steps to 1050 kv.
- Units were subjected to both standard impulse tests and Allis-Chalmers switching surge test.

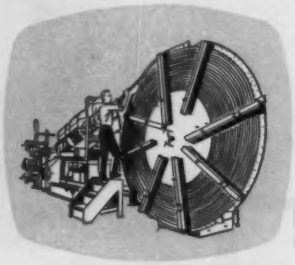
This switching surge test stresses the units differently than either impulse or low frequency tests and *scientifically* determines the ability of insulation to withstand switching surges.

- Design is corona-free to prevent insulation aging or damage due to corona.
- Weight — 480,000 pounds.
- These forced-oil-cooled units are rated 180,000 kva, 3 phase, high voltage 345 kv, low voltage 138 kv, tertiary voltage 12 kv.

For information on Allis-Chalmers transformers or test procedures, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



Integral design cuts transformer size, weight; protects core and coil against mechanical shock in shipment and service.



Circular disc type coils are ideal for resisting distortion stresses caused by heavy fault conditions.

ALLIS-CHALMERS

here's
a powerful
combination!
HIGHWAY'S
HEAVY-DUTY
"HC" DIGGER...
mounted on a
"BLUE OX"
Rugged, powerful digging operation in any type of soil
The Highway HC earth-boring machine can be easily mounted on the "Blue Ox" vehicle or heavy-duty trucks. The compact unit connects to the transfer case with a single drive shaft. Easily available controls allow one-man operation. Highway's exclusive telescoping derrick enables 75' poles to be set. The "HC" machine digs holes from 9" to 36" in diameter, 10' deep. Overall height of both vehicle and derrick is under 10' in traveling position. Write to Highway for further information on this Heavy-Duty HC Earth-Boring Machine, and on the other models available.
HIGHWAY
UTILITY DIVISION
HIGHWAY TRAILER COMPANY
HEADQUARTERS: EDGERTON, WISCONSIN
Manufacturers of: Public Utility Bodies • Earth-Boring Machines • Pole and Cable Reel Trailers • Winches
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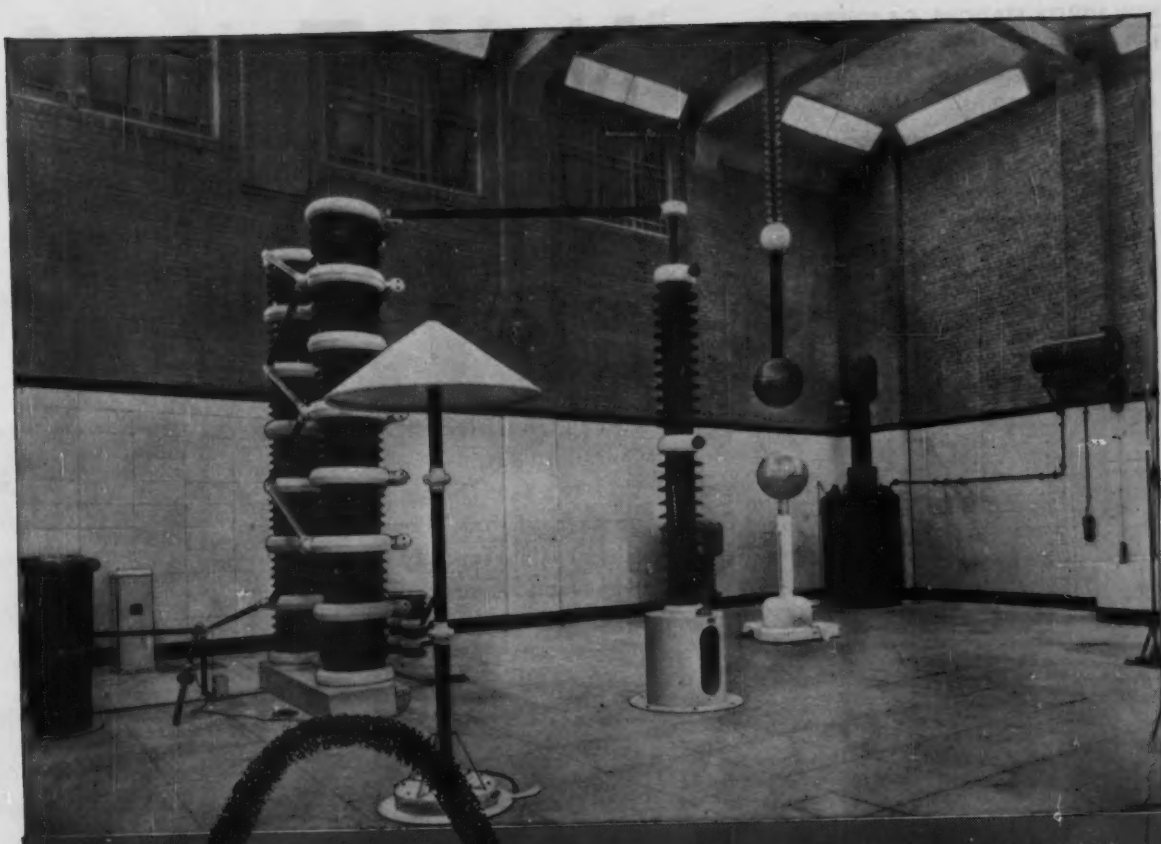

Ferranti
High Voltage
Testing Equipment
installed at the
Manchester College
of Science and
Technology

All the testing equipment illustrated has been supplied by Ferranti Ltd. and is installed at the Manchester College of Science and Technology, Manchester, England. It consists of:

330,000 volt, 100 kVA single phase 50 cycle Testing Transformer and Control Equipment.

750 mm Sphere Gap.

1,400,000 volt, 2 column Impulse Generator complete with Control Equipment and Cathode Ray Oscillograph.

FERRANTI ARE SPECIALISTS in the manufacture of AC and DC Equipments for all kinds of routine and research testing, and are backed by 75 years' experience in the manufacture and development of electrical apparatus.

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NEW UTILITY STATIONS, C-E EQUIPPED

Includes only new stations on new sites placed in operation since JANUARY 1, 1950.

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HUTCHISON
YATES
DUNKIRK
TITUS
LEE
CONTRA COSTA
HAWTHORN
NINEMILE POINT
EDGE MOOR
PALATKA
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BLACK DOG
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LAKE CREEK
ETIWANDA
AURORA
HENNEPIN
EASTLAKE
OAK CREEK
SUWANNEE RIVER
URQUHART
KINGSTON
SANDOW
MULLERGREN
BARRY
NORTH OMAHA
WILMINGTON
CARBON
SAGUARO
MORRO BAY
VERMILION
JOHN SEVIER
COLLIN
MILLIKEN
GALLATIN
BARRETT
MITCHELL
SAN BERNARDINO
YORKTOWN
GULF COAST

TUCSON

New Tucson Goes

When Tucson Gas, Electric Light and Power Company recently placed into service Unit No. 1 at their new Station No. 4, another 75,000 kilowatts were added to their system capacity. The event proved to have much more than usual significance, however, for this addition pushed the over-all capacity of privately-owned electric utility plants in the United States over the 100-million kilowatt mark.

No. 1 is the first of four units projected for this station, with a second C-E unit of the same size scheduled for service early in 1960.

Located in the southeastern area of the city of Tucson, this modern plant of outdoor design was planned and erected by Sanderson & Porter, consulting engineers. It will meet the rapidly growing industrial, commercial and residential electrical needs in this section of our expanding Southwest.

Steam for the new Tucson unit is supplied by a 575,000 pound per hour C-E Steam Generator, a description and cross-sectional illustration of which appear on the opposite page.

C-E

C-165

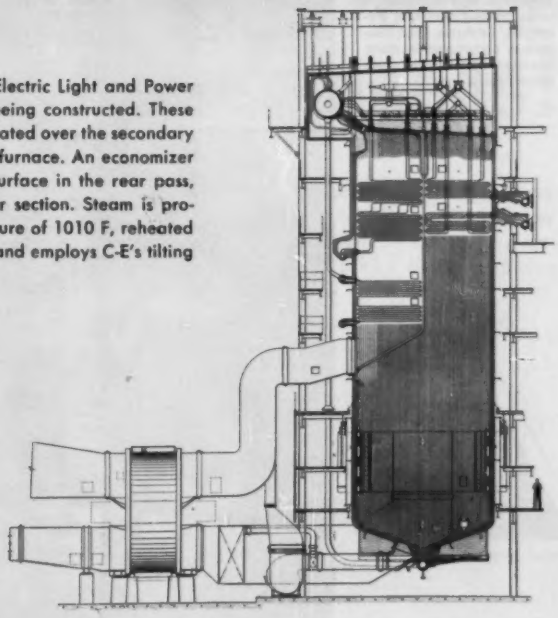
COMBUSTION

Combustion Engineering Building

ALL TYPES OF STEAM GENERATING, FUEL BURNING
PAPER MILL EQUIPMENT; PULVERIZERS; FLASH

Station No. 4 Into Service

This C-E unit is now in service at the Tucson Gas, Electric Light and Power Company Station No. 4. A duplicate is presently being constructed. These are radiant reheat boilers with a reheater section located over the secondary superheater surfaces, which are directly above the furnace. An economizer section is located below the primary superheater surface in the rear pass, and regenerative air heaters follow the economizer section. Steam is produced at a pressure of 1500 psig and at a temperature of 1010 F, reheated to 1010 F. The unit is fired with natural gas and oil, and employs C-E's tilting tangential burners.



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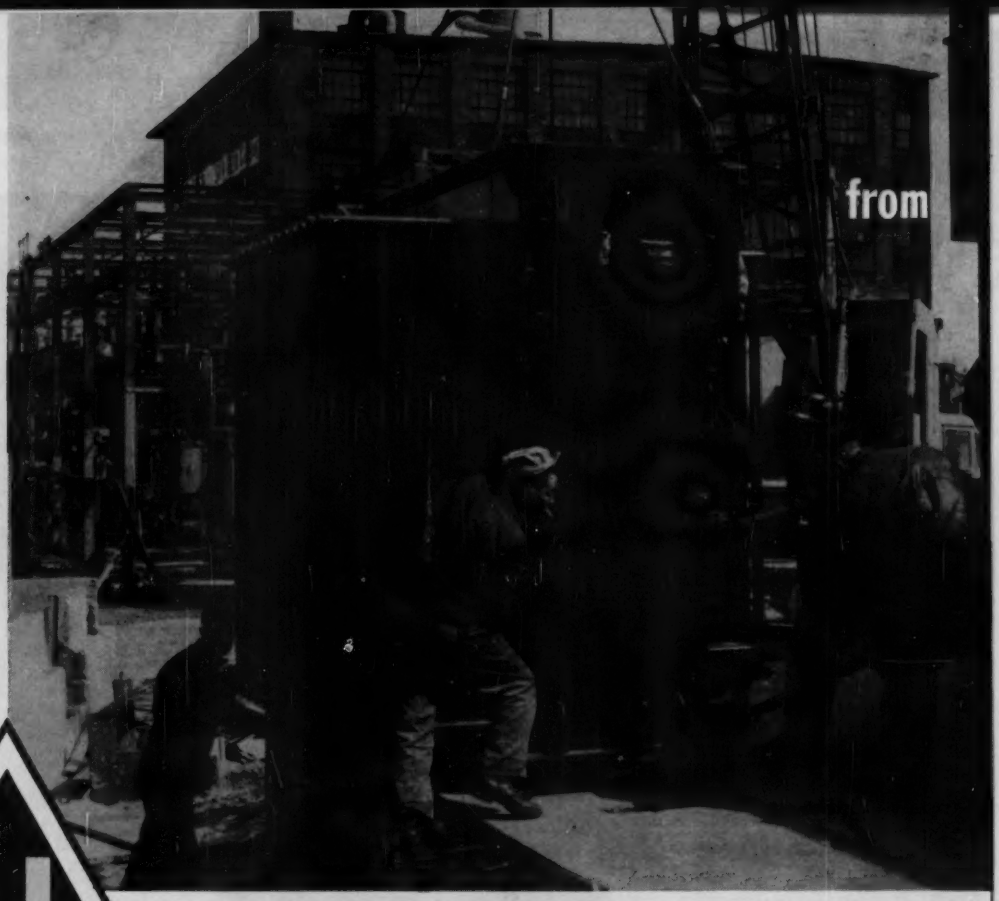
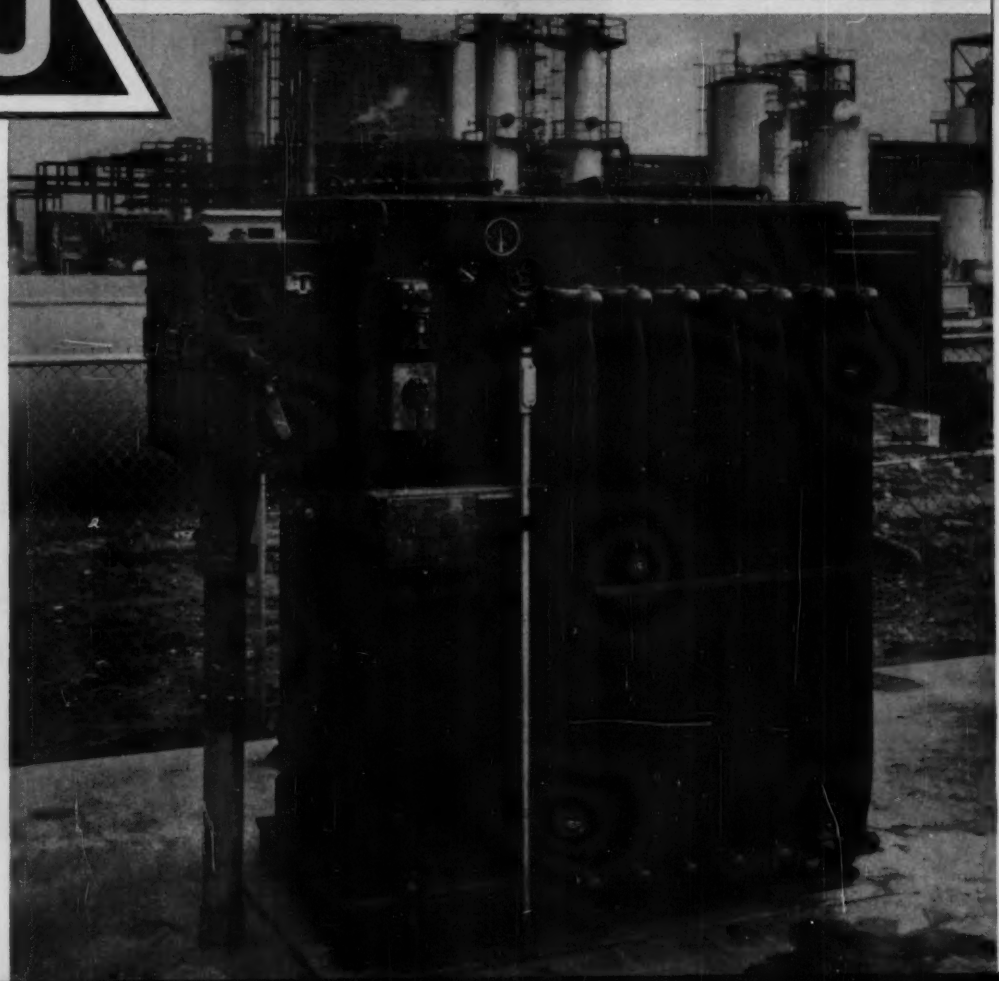
200 Madison Avenue, New York 16, N.Y.

AND RELATED EQUIPMENT; NUCLEAR REACTORS; DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

from

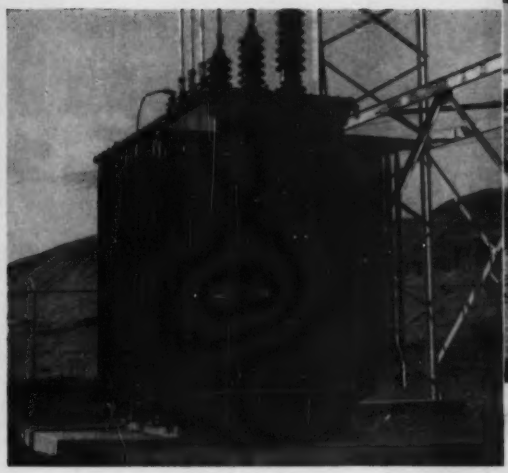


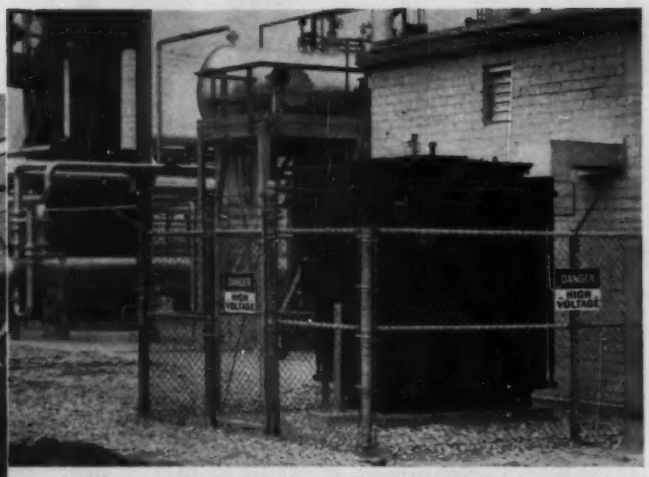
This 2500-kva Uptegraff power transformer, being installed at the Taunton Municipal Lighting plant in Massachusetts, is one of several units used in conjunction with a new 16,500-kw turbine unit.



One of several Uptegraff transformers furnishing power for the Benzene Toluene plant addition to the Richfield refinery at Wilmington, California. Long, trouble-free performance is vitally important in round-the-clock refinery operations.

MASSACHUSETTS to CALIFORNIA





Here is a 1500-kva Uptegraff power transformer located in Cleveland, Washington. It is one of several Uptegraff transformers serving the Klickitat County public utility at Goldendale.

This 1000-kva liquid-filled load center transformer is one of several Uptegraff transformers helping supply the power requirements for a new Celanese Plastics Division plant in Houston, Texas.

Uptegraff transformers serve industry's power needs!

The *extra* quality of today's Uptegraff transformers is due to a forward-looking program in research and development. This involves new and better raw materials, fabricating systems and assembly methods. It has resulted in important transformer advances . . . lasting oil preservation . . . completely leak-proof tanks and fittings . . . use of grain-oriented steel core for lighter weights, smaller sizes, lower core loss and exciting current . . . flow-painted exteriors assure three-mill paint coat and complete coverage . . . etc.

New designs provide capacity beyond normal rating

These improvements *plus* strict quality control in manufacturing and advanced testing methods assure the *extra* transformer capacity *beyond nameplate rating* to successfully withstand momentary overvoltages, high temperatures and other abusive conditions.

Meet the people of the Uptegraff Company

This picture-story booklet will give you an intimate view of the Uptegraff Company, and the people who design and build Uptegraff transformers. *Send for your copy TODAY.*

R. E. UPTEGRAFF MANUFACTURING CO.
SCOTTDALE, PENNSYLVANIA

This look on a pole means KPF

No other air break switches look like KPF, or perform like KPF. The simple, functional design of KPF switches produces a clean pole top appearance. It also insures operating dependability in all weather. There are no delicate, complex mechanisms to freeze, lock, need lubrication or wear out. The light weight of rugged KPF switches means that no extra mounting structures are required.

Lower cost KPF switches have proved their advantages in over 50 years of service on major utilities. Make a test installation this month on your own system.

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AIR BREAK
SWITCHES

Standard for half a century

KPF ELECTRIC COMPANY

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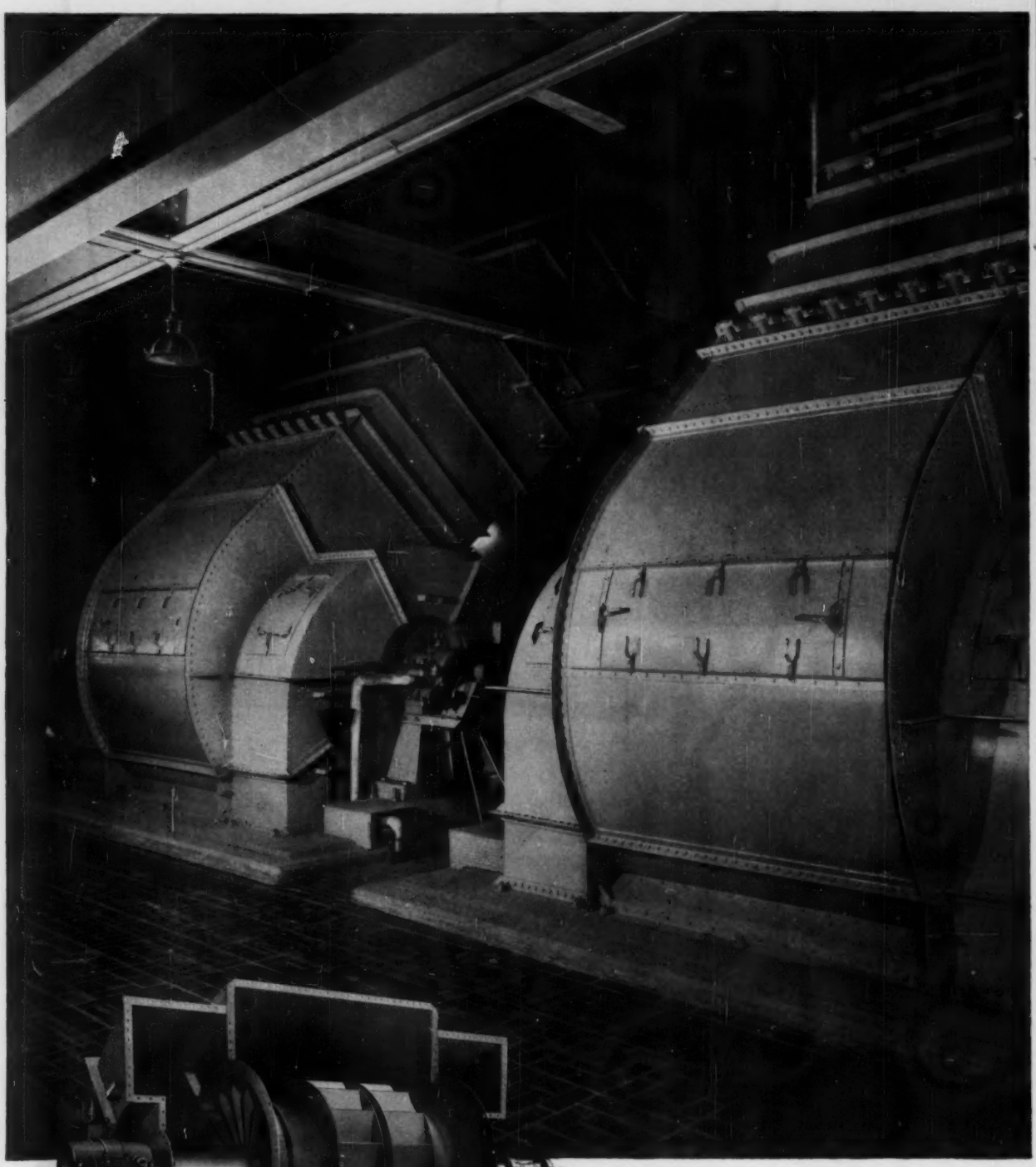


BUFFALO FORGE

BUFFALO,

BUFFALO PUMPS DIVISION

Canadian Blower & Forge Co., Ltd.,

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT

WHY YOU GET MORE AIR PER HORSEPOWER WITH "BUFFALO" AIRFOIL FANS

COMPLETELY STREAMLINED INLET. Wheel flange and matching inlet bell form true half-circle, eliminating turbulence causing flat spots. GENEROUS INLET BOX DIMENSIONS give lower loss through inlet boxes than competitive makes, thus smoother air entry. VARIABLE INLET VANES, when used, are placed well into the inlet throat. Horsepower-reducing spin developed by the vanes is therefore fully utilized by the wheel. WHEEL DESIGN incorporates proper blade passages and air-flow through the wheel, in addition to airfoil blading, to produce maximum efficiencies. SCROLL shape lets air stream from blade passages to the housing channel with greatest ease. DIVERGENT OUTLET provides the optimum of static regain as the air passes from the cut-off, insuring the most efficient performance. Conventional outlet fans have a considerable amount of turbulence at this point.

BUFFALO AIRFOIL FANS ARE BUILT TO:

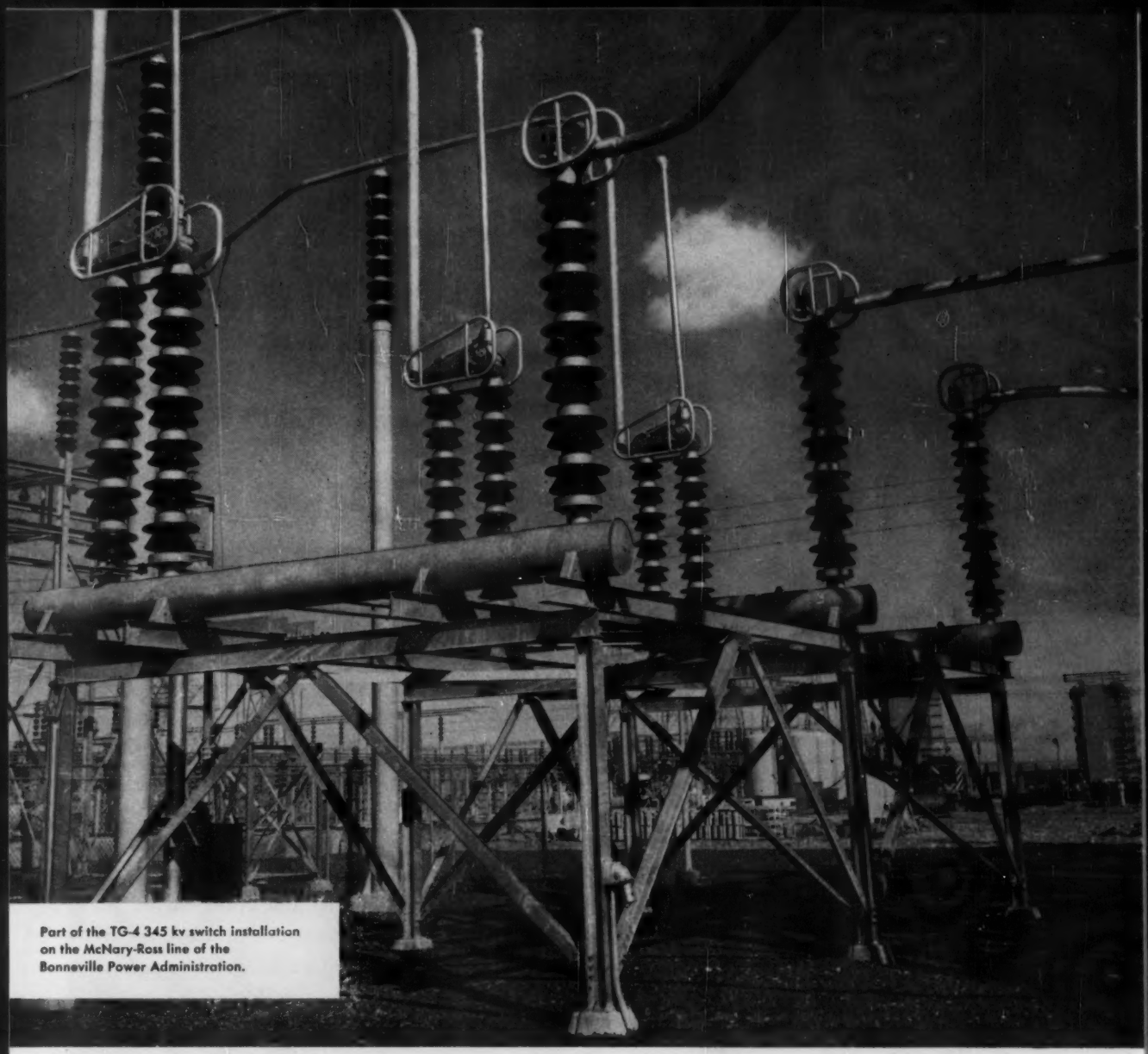
- Capacities in excess of one-half million cfm
- Pressures of 80″ water
- Outlast all other airfoils*

COMPANY
NEW YORK
BUFFALO, N. Y.
Kitchener, Ont.

"Buffalo"

*Every Buffalo Fan brings you the extra benefits of the famous "Q" Factor construction — the built-in QUALITY that assures trouble-free satisfaction and long life.

EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING



Part of the TG-4 345 kv switch installation on the McNary-Ross line of the Bonneville Power Administration.

FROM AIR SWITCHES TO COMPLETE SUBSTATIONS A DEPENDABLE SINGLE-SOURCE FOR ALL YOUR SWITCHGEAR REQUIREMENTS

Federal Pacific TG-4 air switches (illustrated above), were among the first in this country to go into service at 345 kv. Providing consistently safe, trouble-free operation, these extra-high-voltage switches demonstrate the switchgear design leadership Federal Pacific offers you.

Of advanced, simplified design, the TG-4 is available in BIL ratings from 1300 to 1800 kv, 1600 amp continuous current and 70,000 amp momentary current ratings to meet the ever-accelerating trend toward higher and higher voltages.

Whatever your needs—switchboards, low voltage metal-enclosed, medium voltage metal-clad, unit substations, power circuit breakers, power switching equipment or complete substations—you can depend upon Federal Pacific for quality switchgear. For further information write Department APR, Federal Pacific Electric Company, 50 Paris Street, Newark 1, N. J.

FEDERAL FPE PACIFIC

Better Products to Control Electricity

The Electrical Week

FUTURE NEWS ▶ **Look for another large A-plant to be announced soon.** A river bank site for a proposed 150-Mw nuclear station has been selected on the Ohio River upstream from Cincinnati.

Joint Committee on Atomic Energy may be broken up if an idea to create "Science Committees" in both the House and Senate is ever carried out. Idea is that Congress, with the increasing emphasis on guided missiles and basic research, will have to deal with many science aspects, of which A-energy is but one. Possible political by-products: (1) More committees, hence, more chairmanships; (2) Problems now resolved behind JCAE closed doors will be brought into the open.

LATE NEWS ▶ **A-power policy conference plans are being mapped out.** Proposed by GE's Cordiner at EEI meeting, it is still uncertain who will attend.

McGraw-Hill is girding its editorial loins to battle recession. The company's 34 mags are lining up broad editorial modernization projects aimed at boosting business spending.

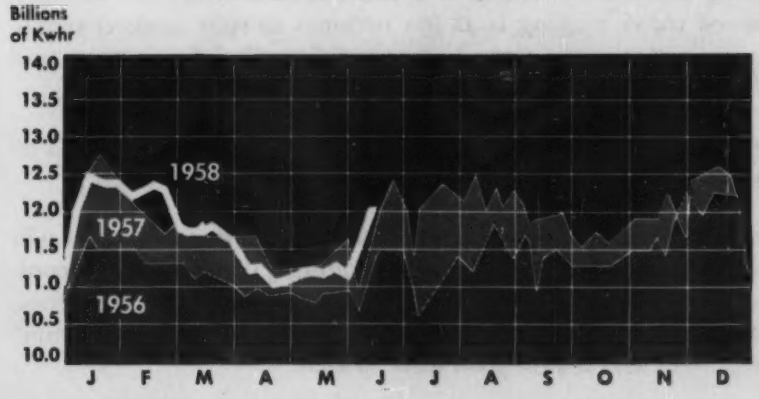
Sen Homer Capehart (R-Ind.) accused Clyde Ellis of being "childish, very intemperate," and of making "false accusations" in asserting administration had a "master plan" to kill REA program.

FPC predicts U.S. power demands will hit 343 kw by 1980, a 2½% increase over prediction made two years ago. 1980 installed capacity will be 394 million kw.

Idaho PUC OK's Northwest exchange of Hells Canyon power. Idaho Power, Pacific P&L, and Washington WP will interchange power from Brownlee and Oxbow dams throughout Pacific Northwest power pool.

New AEC general manager A. R. Luedecke will take over soon from resigning Gen. K. E. Fields. Luedecke, an AF major general, has been closely associated with A-weapons since 1949.

POWER OUTPUT—Up 1.3% (Week ending June 14), Kwhr 12,109,000,000



Per Cent Change From Previous Year

	May 31	June 7	June 14
Total U. S.	+2.0	+1.1	+1.3
New Eng.	+2.1	−0.5	−0.4
Mid. Atlantic ..	−0.4	−1.3	−1.2
Cent. Ind.	−2.0	−2.8	−1.8
West Cent.	+7.0	+4.3	+4.4
Southeast	+0.5	−0.1	+2.0
South Cent.	+17.0	+25.1	+14.0
Rocky Mount. ..	+18.1	+8.1	+6.8
Pacific			
NW	−9.9	−9.8	−10.5
SW	+3.4	−0.4	+3.3

Seasonally Adjusted Index 232.1

Week Ago 228.4 Year Ago 230.3

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World Estimate). Excluding AEC, Output increase was 2.2%.

A TWO-MINUTE PREVIEW OF THIS ISSUE

EVENTS ▶ **"Power Is Our Business"** was the theme of EEI's 26th annual convention in Boston. Delegates heard leaders from inside and outside the industry explain how to plan financing, meet gas competition, organize efficiently, and how to cope with the threat of federal encroachment. Special 16-page report starts on **p 85.**

EEI directors approved a new national sales program, named a ten-man committee to oversee it. Six representatives will be from all-electric utilities, four from combination companies. Contributions to the program will be voluntary **(p 81).**

Tornadoes ripped out lines in Wisconsin and Kansas, caused over $200,000 damage **(p 80).**

ATOMIC ▶ **One million kw of new atomic power capacity** within the next five to seven years—that's expected to be part of the program coming out of the Democratic-run Joint Committee on Atomic Energy. The 1959 AEC Authorization Bill is due by July 4 **(p 79).**

JOINT PLANNING ▶ **Arizona PS Co and Salt River Power District agree** on joint system planning and operation, delineate territorial boundaries. Here's how their new contracts work **(p 82).**

DISTRIBUTION ▶ **Splicing of service drops and service loops is easy** with a simple wire holder devised at Worcester County Electric Co. It is made from six inches of wire and two spring clips **(p 102)** . . . American Electric Power finds a use for surplus 2,400-v transformers: Put them in parallel with installed units **(p 104).**

GENERATION ▶ **A sheet of Saran Wrap** helps locate leaking tubes in divided water-box condensers at Virginia Electric & Power Co's Portsmouth Power Station **(p 102).**

TESTING ▶ **A transistorized microammeter** developed by the National Bureau of Standards covers a range from 50 cps to 100 kc **(p 104).**

MEETINGS ▶ **Three groups of the Pennsylvania Electric Association** met recently, discussed topics ranging from gas turbines to split radio channels. The committees were System Planning, Electrical Equipment, and Communications. **Report on p 84.**

Five ways that safety pays were discussed by the EEI Accident Prevention Committee at a recent meeting in Toledo **(p 207).**

EMPLOYEES ▶ **A boom in suggestions** was recorded last year at Dayton Power & Light Co as employees submitted 772 ideas, doubling their previous record. What's behind the rush to the suggestion box? Bigger cash prizes, yes; but DP&L also gives credit to "greater personal recognition" of employees who submit good ideas **(p 195).**

RATES ▶ **Rate increases in 1958 may be diluted somewhat** by combined factors of election year opposition and the staying power of the recession. "There's always someone willing to wave the banner" against utility hikes, is the way one power company man puts it. Big rate hike deterrent is commission views on lower costs of money now.

BUSINESS ▶ **Worst of the recession is probably over.** Although it will be some time before the economy regains its health, latest business statistics are the most encouraging since recession began. Homebuilding, steel, and business sales show strength; kwhr output is beginning to rise, and industrial production turned up in May for the first time in nine months (p 187).

SELLING ▶ **A school brought its 20-year-old electric kitchen up to date** by installing 113 kw of brand new electric cooking equipment . . . A "Main Street Modernization" program is lighting up the towns in Kentucky Utilities' service area. In first three months of '58, KU's program sold 71 new store fronts (p 180).

INDUSTRIAL ▶ **A custom-tailored lighting system is paying off** for the Pittsburgh Reflector Co. With illumination planned to suit the need in each work area, efficiency has gone up all over the plant . . . Hauling crushed rock on an 800-ft belt conveyor cuts costs for a quarry in Maryland (p 184).

MANUFACTURERS ▶ **What's an SRT?** It's Line Material Industries' new self-regulating distribution transformer, which was demonstrated for the first time last week to utility men. Transformation ratio changes automatically in 2.5% steps over a 10% voltage range to provide self-regulation. Details on p 108 . . . The trend to larger units shows up in EEI's 23rd Semi-Annual Electric Power Survey: Units of 100-Mw and over account for better than 90% of planned thermal generating capacity, and 17% is in units 300 Mw and up (p 155).

NEW EQUIPMENT ▶ **Side break disconnect keeps blade tip aligned** even when base is distorted. Self-adjusting blade has 10-deg tilt, 12-deg axial freedom . . . Streetlight control has no tubes, features long life, reliability; incorporates time delay mechanism to prevent false switching . . . A new 200-kw silicon rectifier is designed for heavy duty, has 75-750 v output. (p 160).

PEOPLE ▶ **Paul O. Canaday will move into executive vice president slot** at Arkansas Power & Light, effective Sept. 1. He remains vice president of Middle South Utilities until then . . . C. Edmunson Jones is a newly appointed VP of Mississippi Power & Light, where he will continue in personnel relations . . . Tuscon Gas, Electric Light & Power creates position of executive vice president, appoints J. Luther Davis to the post (p 196).

Training new personnel and familiarizing non-technical employees with utility operations are tasks that will always be with utility companies. Two recently published books, **"Basic Electrical Power Distribution" Vol I and II** should prove useful in this undertaking. Based on a training course developed for an operating utility and written by an experienced utility engineer, these books describe in simple, non-technical language the electrical distribution system—both overhead and underground. Also included is material on street lighting and service factors. Going on the premise that a picture is worth a thousand words the author tells his story through illustrations, diagrams, and supplementary text—**Basic Electrical Power Distribution, Vol I and II. By A. J. Pansini. Published by John F. Rider Publisher, Inc, 16 W 14th St, New York 11, N. Y. Price $2.40 per volume.**

TECHNICAL NOTES

The hazards of a person receiving a fatal shock and of being frozen to the circuit are somewhat greater at 240 than at 120 v. Ac currents of 330 ma flowing for a third of a sec or 100 ma for 1 sec may throw the heart into ventricular fibrillation which could prove fatal.

Cost of maintenance for base-load gas turbines falls at the lower end of the range of dollars per kw per year costs generally accepted for large steam stations.

Nuclear power plants will devote on the average 2. 5 to 3% of capital costs to instrumentation. Conventional power plants require only about 1%.

FROM EDITORS IN THE FIELD

Waste heat boilers will be combined with four gas turbines to provide Gulf Italia, Sicily's largest crude producer, with about 3,000 kw of power and energy to heat crude oil delivered to a pipeline. Each boiler can receive exhaust gases from one of two turbines and each turbine can send gases to one of two boilers.

Capacitors are being installed on cable termination poles, in addition to lightning arresters, to reduce possible damage from lightning. Louisiana Power & Light Co mounts one 25-kvar unit per phase between the double arms, rather than on a bracket. Since installing the capacitors five years ago, cables have not been damaged.

Ask for it

IF YOU EXPECT TO GET IT

Your own company records will justify the slight extra trouble of specifying "O-B" on switchgear purchases

Manufacturers of switchgear and package substations are always willing to furnish any kind of insulator you ask for -- but if you *don't ask*, you *don't know* what you are getting.

Is it worth the trouble to ask? The answer is right in your own office. You can find when insulators went into service, what kind they were, what replacements have been made, and why. Do this, and you will find why you should ask for O-B.

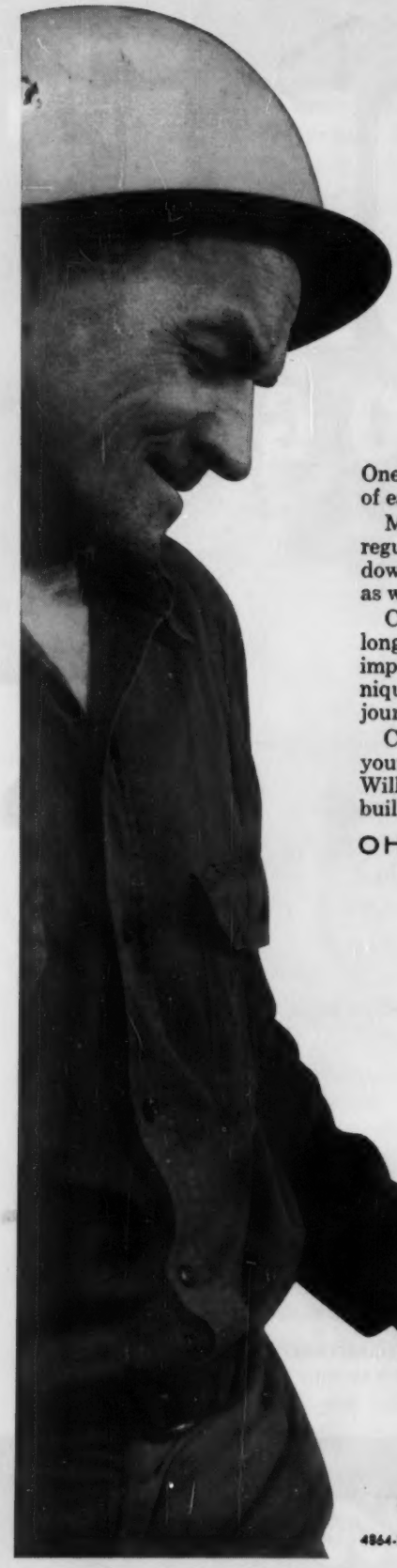
At no extra first cost, the element of service life measures the wisdom of your purchasing investment.

On all orders for new equipment involving switch and bus insulators, specify O-B by name. Your own records will justify this slight extra trouble.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

4905-H

Ohio Brass



"Here's Why I Know They're Good"

LOOK FOR THE CLUES THAT PAY OFF IN BETTER INSULATOR PERFORMANCE

One of the best clues to future performance of an insulator is performance of earlier units from the same manufacturer.

More than 40 million O-B suspension insulators have been produced. We regularly get reports on 30-and 40-year-old units that have been taken down, possibly because a line is rebuilt, and found to be practically as good as when they were installed.

Clue No. Two . . . if those old-style units are still good, think how much longer the ones now being produced will serve. They have the benefits of improvements in design and materials, in manufacturing and testing techniques. You'll find these discussed in O-B Hi-Tension News and in trade journal advertising.

Consider these clues as you build and plan new lines. Are you giving yourself the benefit of the plus difference available in O-B insulators? Will someone 40 years from now look at the lines and say, "I'm glad they built with O-B"?

OHIO BRASS COMPANY, MANSFIELD, OHIO

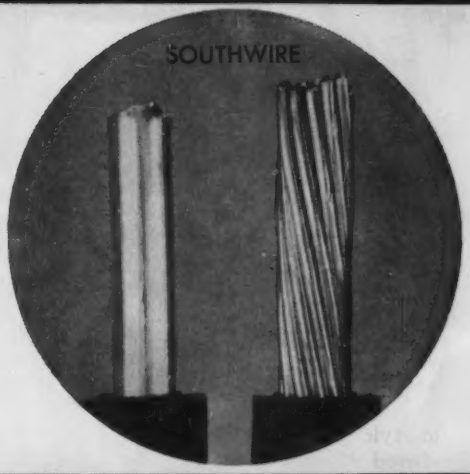
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

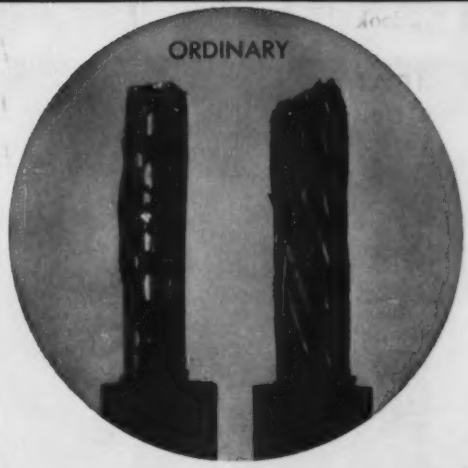
Trade journal advertising tells about the plus values in O-B insulators.

4864-H

100% FREE STRIPPING



ACTUAL UNRETOUCHED PHOTOS
ENLARGED THREE TIMES
SHOW THE DIFFERENCE



Southwire NEOPRENE covered copper wire

- **Strips Many Times Faster**
- **No Scraping Necessary for Connections**
- **No Sticking or Discoloration**
- **No Premium in Price**

ANOTHER SOUTHWIRE FIRST!

The one single headache associated with Neoprene Covered Copper Wire—sticking and discoloration—has been eliminated by Southwire. After three years of exhaustive research, testing, and development, Southwire now provides a completely new compound that is 100% free stripping. None of the manifold advantages of Neoprene covering have been sacrificed. You get a far superior product at no premium in price when you specify Southwire Neoprene Weatherproof Copper Wire.

• FREE SAMPLES AND TECHNICAL DATA ON REQUEST

SOUTHWIRE serves the world

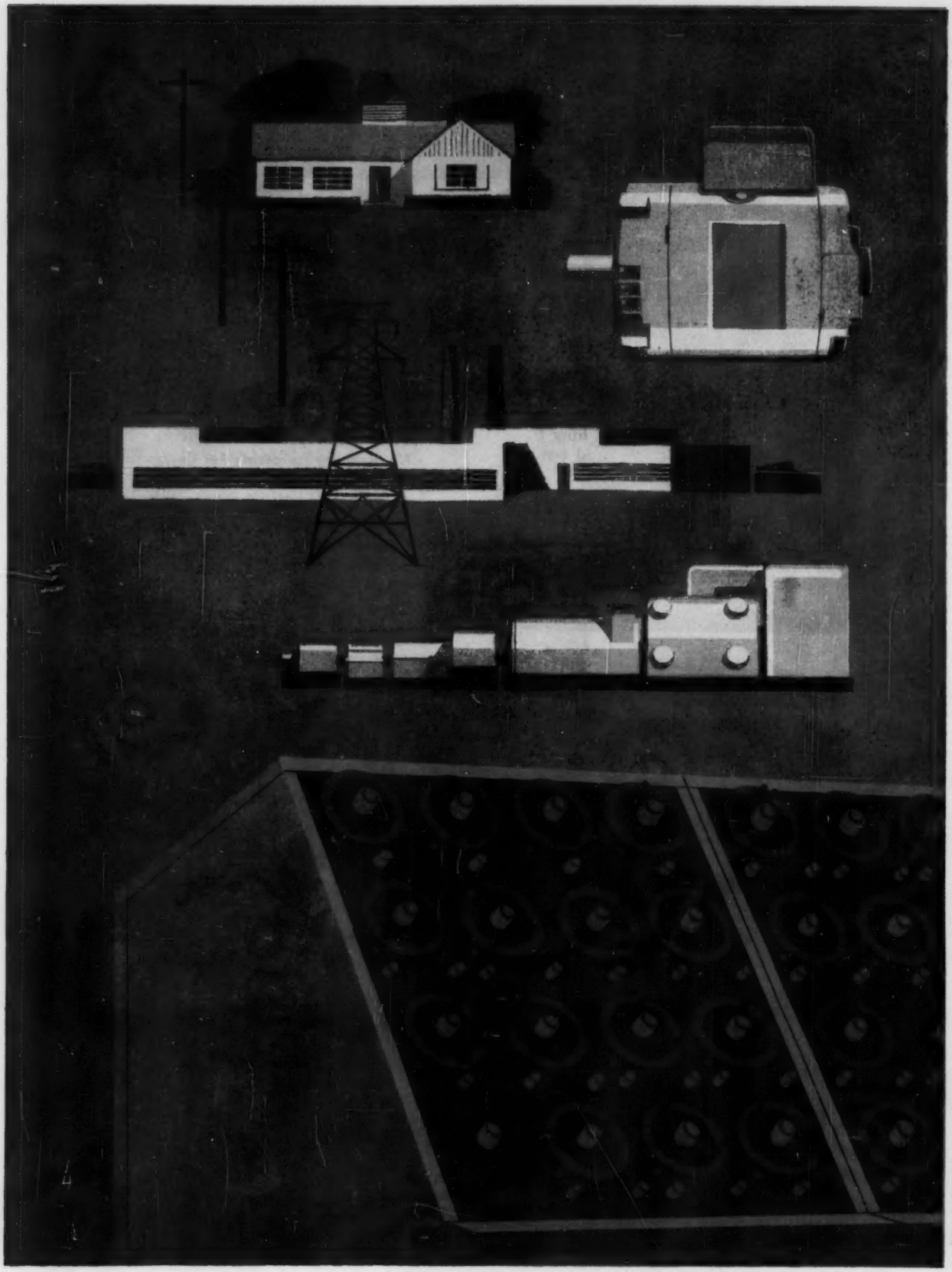
with these quality products:

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP* (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories

Southwire® Company

TErrace 2-6311 CARROLLTON, GEORGIA

• ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS



WESTINGHOUSE

AUTOMATIC DISPATCHING

Improves operation of your system • Reduces your generating costs

Building upon proven control techniques, Westinghouse has developed *new concepts* to make automatic power system control practical for *any size* utility. This new equipment has many unique features with unusual flexibility and is designed to meet the exact requirements of your system.

Savings with Westinghouse Automatic Dispatching System will quickly pay for this investment . . . with simplified dispatching to meet daily load schedules, automatically computing transmission losses and accurately maintaining tie-line pool operations.

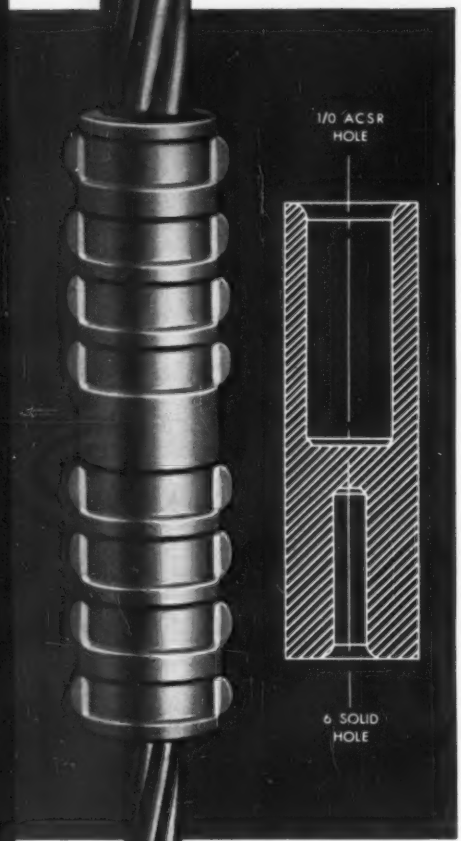
A Westinghouse Automatic Dispatching System brings you *modern* control for: improved economies, better intercompany relations, improved service and optimum use of tie-lines. Equipment continuously regulates generation to match system requirement, maintaining all machines in economic dispatch.

For information that can lead to more economical operation of your system, ask your Westinghouse sales engineer about the new Westinghouse Automatic Dispatching System. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. Ask for Folder B-7580. J-60960

YOU CAN BE SURE...IF IT'S Westinghouse

POWER CONTROL SYSTEMS

You get HIGHER CONDUCTIVITY with BLACKBURN SERVICE ENTRANCE SLEEVES



because Blackburn... and Blackburn alone... provides

GREATER CONTACT AREA where needed

Hole Depth Increases With Size of Conductor... thereby providing more contact area for the conductors being connected.

COLOR CODE	WIRE SIZE ACSR	WIRE SIZE AWG	HOLE DEPTH IN INCHES
Brown	–	8 sol — 10 str	.820
Green	–	6 sol — 8 str	.840
Blue	6	4 sol — 6 str	.860
Orange	4	2 sol — 4 str	.925
Red	2	1 sol — 2 str	1.010
Yellow	1/o	1/o str	1.185

The center stop in a Blackburn Sleeve is a solid barrier that assures proper distribution of the inhibitor around the conductors.

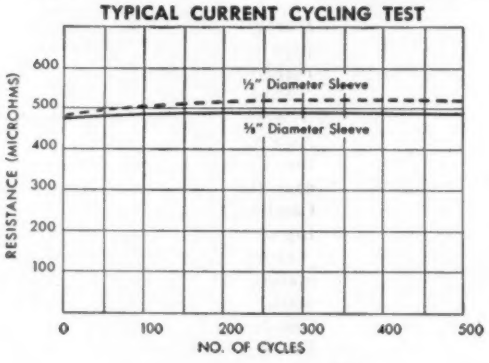
FIRST! Printed (not indented) permanent COLOR CODING *is easier to read*—makes size identification positive and quick.

FIRST! Aluminum Sensitized Tape seals the Blackburn Sleeve's ends. Easy to puncture... and, if a particle of the seal is pushed into the chamber, it is conductive.

FIRST! Each Blackburn Sleeve contains the superior Blackburn inhibitor, Contax, *in measured amount.* Won't squirt out on glove or in face.

LIVE BETTER ELECTRICALLY

Conductivity of Connection PROVED GREATER Than Equivalent Length of The Conductors Being Connected.



A series of typical current cycling tests were conducted with both ½" x ⅜" diameter BLACKBURN Sleeves. Note the lower resistance of Blackburn Sleeves as compared to the equivalent length of cable without any sleeve.

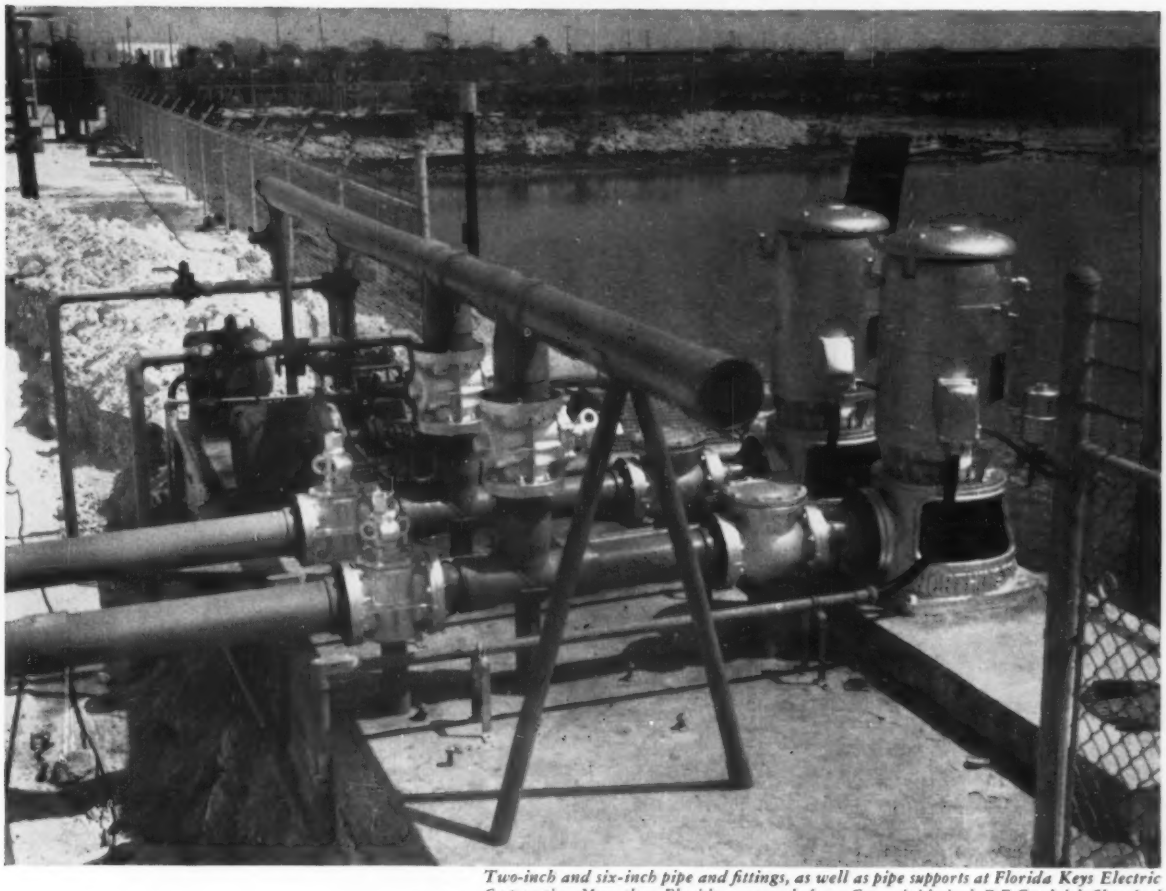
Test Conditions

Wire: 2 ACSR to 4 stranded copper
Current: 190 Amperes
Cycle: 2 Hrs. "On" 1 Hr. "Off"
Length of Connection: 24 inches
Curves represent an average of five tests
Resistance of equivalent length of wire: 527 Microhms

JASPER BLACKBURN CORPORATION, 1525 Woodson Rd., St. Louis 14, Mo. • WYdown 3-9430

News about

B.F.Goodrich Chemical *raw materials*



Two-inch and six-inch pipe and fittings, as well as pipe supports at Florida Keys Electric Cooperative, Marathon, Florida, are made from Geon rigid vinyl. B.F.Goodrich Chemical Company supplies the rigid vinyl material only.

Pipe of Geon cures corrosion caused by ground currents

SEA water is used in the raw water system of this diesel generating plant, and electrolytic corrosion of the metal piping in the raw water system created quite a problem. Then pipe made from Geon rigid vinyl was installed and, after two years of operation, there is no corrosion problem in the piping handling the sea water.

The addition of a larger diesel unit to the plant now calls for six-inch pipe made from Geon rigid vinyl to handle the salt water used in cooling the diesels and lubricating oils, and for piping Bunker C fuel oil from the oil storage tanks to the plant. Even the pipe supports are made from Geon rigid vinyl.

Pipe of Geon is the logical choice wherever corrosion causes problems. And there are installation savings, too. Pipe of Geon is lightweight and easy to handle. Contractors like it. Can be readily joined by solvent welding or standard threaded fittings.

How can you benefit from pipe made of Geon rigid vinyl? Get information by writing Dept. LR-7, B.F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio.

Cable address: Goodchemco.
In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR American rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

New cost-cutting control for central station operations...

with dependable,
Philco Industrial TV Systems

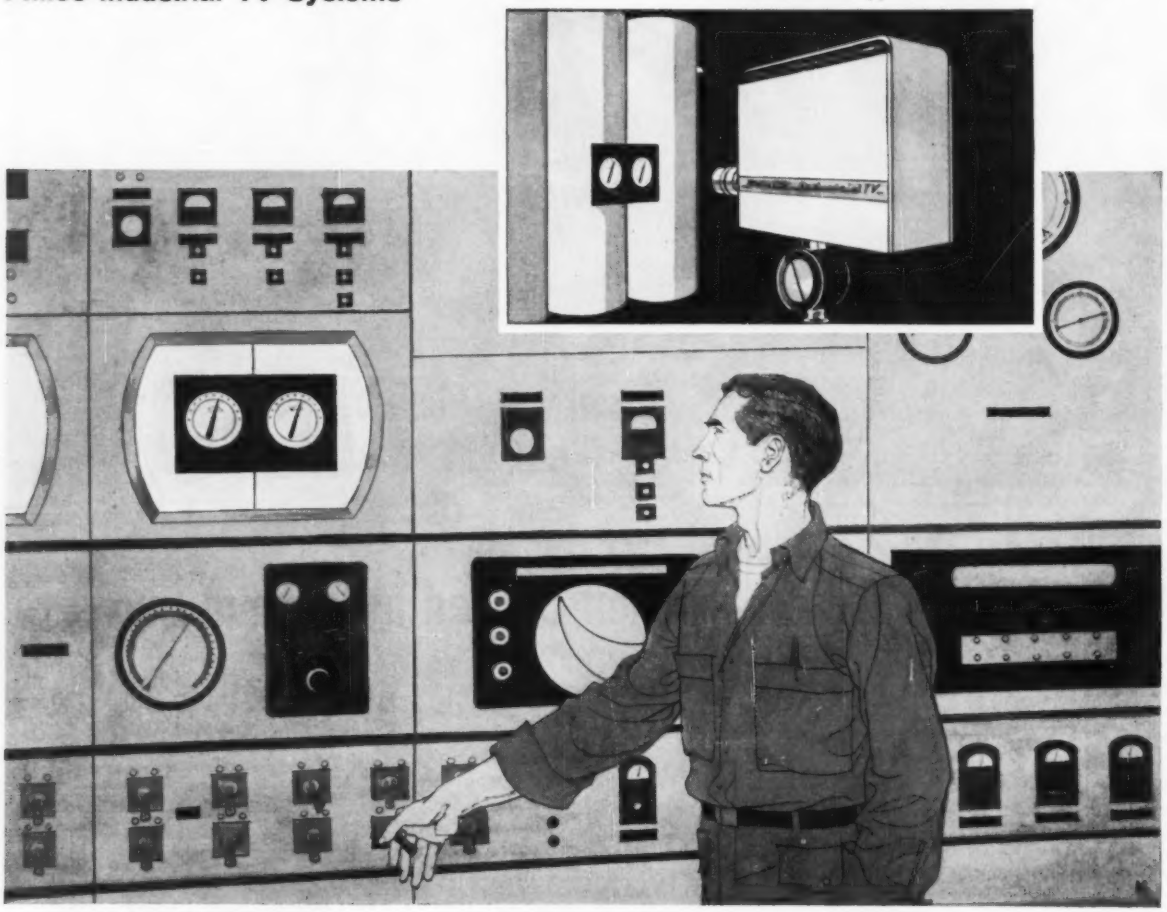
HERE IS safe, positive, visual control of boiler water level gauges, stack discharge, boiler feed pumps, valves, gauges and switches of all types. Picture clarity and detail of new Philco ITV systems is unsurpassed. See where you can't be . . . every critical area . . . from a single, central control point. You can actually read gauges and dials at light levels as low as 10 foot candles.

Philco's complete line of ITV accessories extends the use of your basic system and permits maximum flexibility. Remote pan and tilt . . . remote iris and focus . . . Auto-Zoom lenses . . . lens turrets . . . weatherproof housings . . . explosion resistant housings . . . all assure complete versatility and adaptability to any installation through Philco's "building block" techniques.

For economical and efficient remote visual control . . . specify Philco ITV Systems.

To meet the challenge of advancing technology and support expansion of scientific education, opportunities at Philco are unlimited in electronics and mechanical research and engineering.

Send for illustrated brochure, describing complete Philco ITV equipment and systems.



PHILCO®

GOVERNMENT & INDUSTRIAL DIVISION

4712 Wissahickon Avenue
Philadelphia 44, Pennsylvania

In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

TEAR OUT ALONG THIS LINE AND FILE THIS FOLDER FOR REFERENCE

SRT Transformer

From the
research and development
laboratories of Line Material

A Revolutionary New Engineering Development

By **RODGERS G. WHEATON**
President
Line Material Industries

For over ten years, Line Material engineers have been working toward the development of a self-regulating distribution transformer. They have recognized that to apply voltage regulation to a line is most desirable; but that the place where load variations start is with the individual power user or small group of users.

Regulation—At the Load

Therefore, if the electrical industry can supply an unvarying voltage in the face of widely varying demands of the individual home or building, we will to a large extent solve one of the major operating problems of the industry.

The requirements were rigid. But the engineers have succeeded. Today Line Material announces the first Self-Regulating distribution Transformer —which we call the SRT.

Production To Be Increased

For the time being, the available number of SRT's is limited. We will increase production as rapidly as possible. Those now available will be sold to utility companies who are willing, for the benefit of the industry, to cooperate on a test program.

We are asking the companies who buy these SRT's to test them in various types of service where their operation and economies can be recorded.

Let Us Send You Information

If now, or in the future, you may be interested in cooperating in this test program, let us send you technical information that will better enable you to analyze your own opportunities for taking advantage of this outstanding new type of transformer. Phone, wire, or write: Line Material Industries, Milwaukee 1, Wisconsin.

LM®

LINE MATERI

McGRAW-EDISON C

Distribution Tra

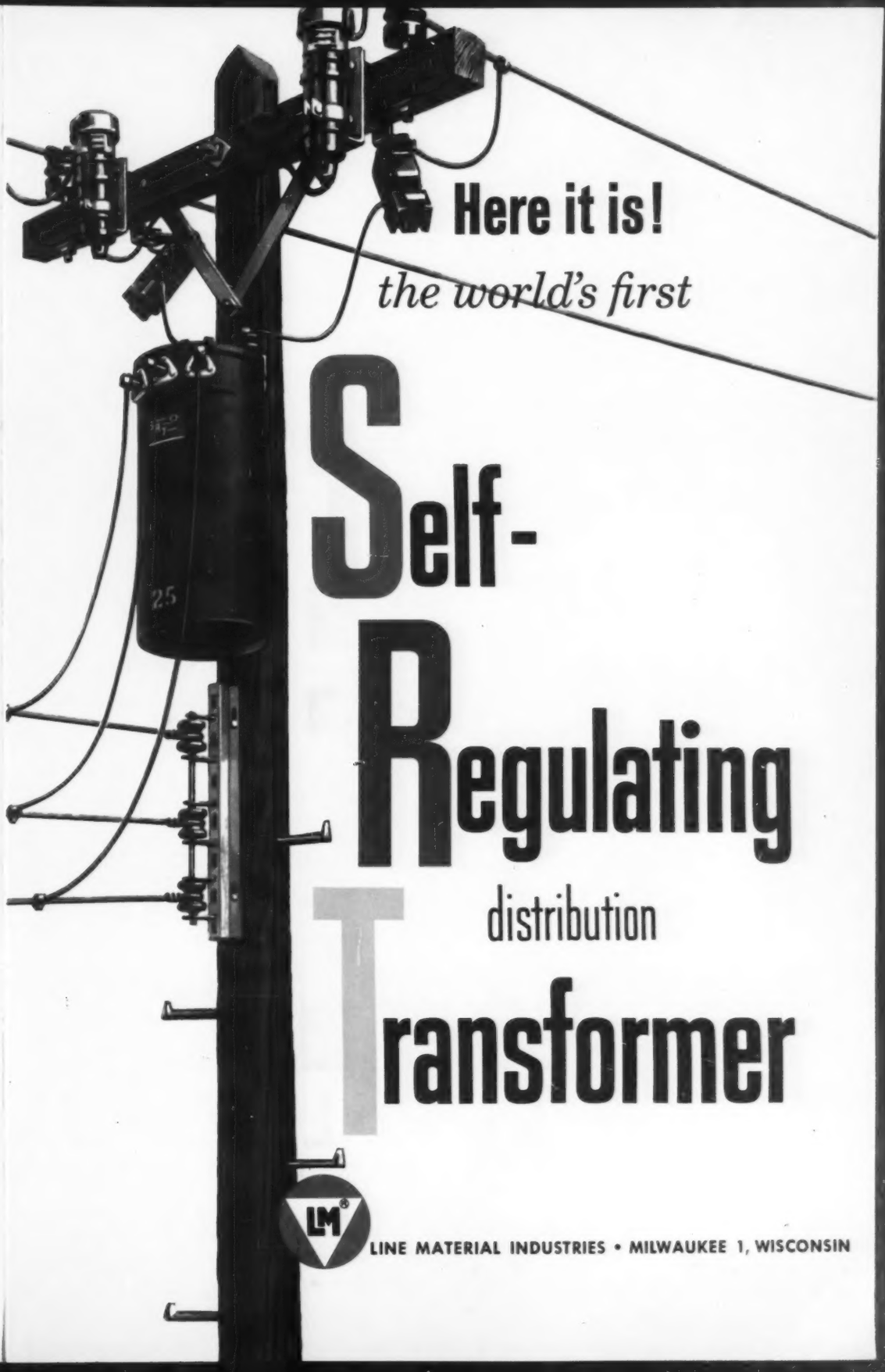
SRT

ERIAL Industries

N COMPANY

Transformers

McGRAW EDISON



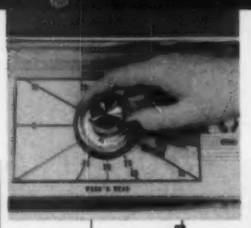
Here it is!

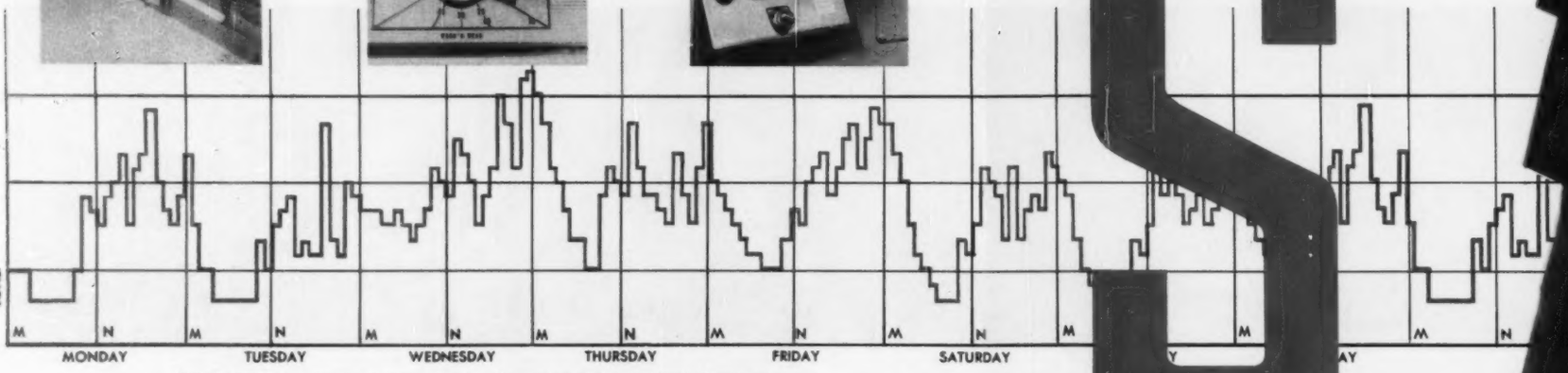
the world's first

Self-Regulating distribution Transformer

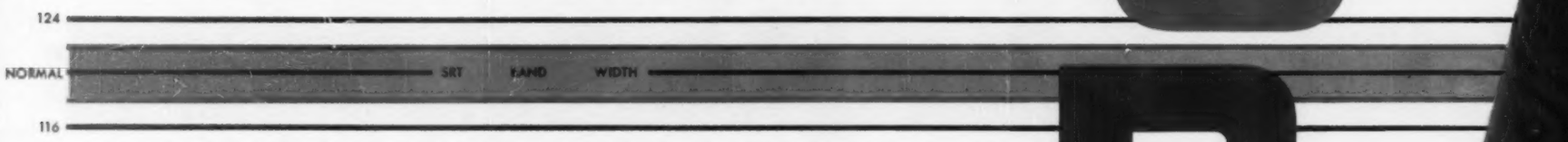
LM®

LINE MATERIAL INDUSTRIES • MILWAUKEE 1, WISCONSIN





Actual utility company load curve on a transformer for an August week (blue line).



With SRT, voltage would have been maintained within the band width (red line) under the above load conditions.

HOW THE SELF-REGULATING TRANSFORMER WORKS

By **RICHARD C. KIRK**
Manager of Engineering, Kyle Products
Line Material Industries

By **ROBERT P. THOMPSON**
Manager of Engineering, Transformers
Line Material Industries

The new L-M Self-Regulating Transformer consists of a Round-Wound® distribution transformer with extra taps on the *primary*, and a regulating mechanism that is volt-sensitive on the *secondary*. The device switches primary taps to change the transformation ratio as needed.

Meets Rigid Requirements

We have worked over ten years to perfect this system. It fully meets our rigid requirements—compactness, extreme reliability, and long life. One 2400 volt tap changer has now operated more than 250,000 times—equivalent to over 40 years' life on a 25 kva transformer.

"Adapt-a-Tap" Range Selector

A unique feature of SRT is the "Adapt-a-Tap" range selector. It provides a full 20% range within which the taps for the 10% automatic regulation, in four 2½% steps, may be selected, all below, straddle, or all above normal. Thus, SRT can be located *anywhere* on the line, at the end, the middle, or near the substation.

Nominal 3½-Volt Band Width

The midpoint is set at 120 volts. SRT operates whenever the voltage drops to 118¼ or rises to 121¾. Each operation occurs only after a time delay. This prevents undesirable operation or "hunting" on switching surges and momentary voltage variations outside the band width.

An Outstanding Contribution

We believe the application of voltage regulation to the individual customer to be of extreme value to the utility industry, and we are confident that the design of the SRT will fully meet the requirements set for it.

The SRT is a significant departure in the field of voltage regulation, because it corrects the voltage *at the point of use*. The SRT corrects overvoltage; it compensates for line drops and load increases.

Prevents Undervoltage

For example, if two or three customers turn on their ranges at the same time, causing a voltage drop, the SRT will, after a time delay, change taps and return the voltage to the desired level. If additional loads drop the voltage again, the SRT again brings it back up.

Prevents Overvoltage

Near the substation, where the primary voltage may be too high, the SRT prevents overvoltage from reaching the user. This greatly reduces burnouts of TV tubes, and of incandescent lamps—the latter a very obvious saving to a company with a lamp replacement program.

Increases Income For The Utility

It is a known fact that low voltage causes loss of revenue. By maintaining proper voltage, the SRT prevents the drop in billings caused by undervoltage, which in the aggregate can represent a considerable loss to the utility company.

Improves Customer Relations

With correct voltage, lights are brighter; television sets, clothes dryers, air conditioners, and other appliances operate at maximum efficiency; ranges heat faster.

Thus the SRT offers the utility savings, in several ways, and many opportunities for improved customer relations.

SRT—The Self-Regulating
distribution Transformer—
consists of an L-M Round
assembly with special ta
under-load tap changer (
the exclusive L-M regulat
SRT's will be available in

2400 volts, 10 through 2
4160 volts, 10 through 3
4800 volts, 10 through 5
7200 and 7620 volts, 10
12,000 and 14,400 volts,

LINE MATERIA

McGRAW-EDIS

egulating
sformer—
M Round-Wound
pecial taps and an
hanger (below) and
M regulating mechanism (above).
ailable in the following ratings:
hrough 25 kva
hrough 37½ kva
hrough 50 kva
volts, 10 through 75 kva
00 volts, 10 through 100 kva

RIAL Industries
DISON COMPANY

WHAT THE NEW SRT WILL DO FOR THE UTILITY COMPANY

By A. R. WAEHNER
Director, Transformer Sales
Line Material Industries

We believe the SRT is the greatest advance in distribution transformers since Line Material introduced the Round-Wound® design. Nothing like it has ever been available. We feel we have broken through a barrier of tradition and limitations imposed by historic design and manufacturing problems. Today, the new SRT offers a utility company an opportunity to improve its service and its revenue, with the use of a low-cost device that achieves very desirable results.

Better Revenue

What the SRT offers the utility company is a solution to the low-voltage problem—which causes low monthly billing and inferior performance of electrical appliances and lights for the individual customers. The conventional step regulator in the line can at best average out the voltage problems. The SRT corrects the voltage right at the point of consumption—the customer.

More Economical Regulation

Under normal conditions, SRT will prove more economical than other means of voltage correction. This opens unlimited horizons to the distribution system design engineer for more effective and efficient planning.

Available For Tests

The initial production run of these units will be sold to progressive companies to explore the benefits available from this new development.

We realize that all companies must of necessity keep their income up and their costs down. We feel that the SRT will make a substantial contribution toward both of these goals.

Get the Detailed Facts

L-M Field Engineers and Apparatus Specialists will be calling on our customers as quickly as possible to provide detailed information about the SRT. If you would like this information, please get in touch with your L-M Field Engineer, or phone or wire me at Line Material Industries, Milwaukee 1, Wisconsin. We shall be glad to provide you with the details about this revolutionary engineering development.

LM®

McGRAW EDISON

Distribution Transformers

348

TEAR OUT ALONG THIS LINE AND FILE THIS FOLDER FOR REFERENCE

SRT Transformer

PAGES MISSING

IN

NUMBERING ONLY

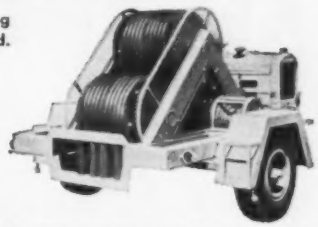
PENGO *Job-Proved Tension-Stringing Equipment*

Manufactured by the makers of the World Famous PENGO Earth Auger

NOTE: More than 40 models of PENGO Tension-Stringing equipment models are available for every stringing need.

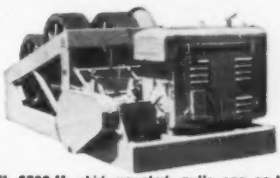
PENGO Bullwheel Cable Pullers

MODEL 6100 TC-RW Reel Winder.



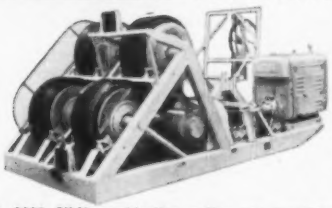
MODEL 5700-II, trailer mounted, pulls one or two conductors or pulling lines. Tensions to 4,000 lbs. Use with PENGO 6100 TC-RW Reel Winder.

MODEL 6700-I, trailer mounted, pulls one conductor or pulling line. Tensions to 12,000 lbs. Use with PENGO 6100 TC-RW Reel Winder.

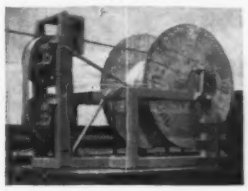


MODEL 6700-II, skid mounted, pulls one or two conductors or pulling lines. Tensions to 12,000 lbs. Use with the 6100 TC-RW Reel Winder.

PENGO Tensioners



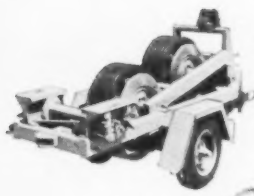
MODEL 6000 SK-II combination puller and tensioner. Handles one or two conductors to 1,272,000 CM.



MODEL 5000 S-I strings one conductor to 556,000 CM. Tensions to 2000 lbs., takes reels to 44" x 72".

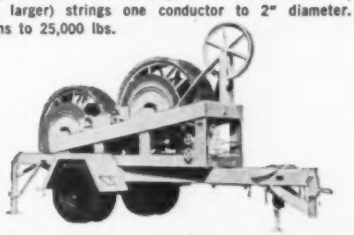
MODEL 5000 TR-II strings one or two conductors to 556,300 CM. Tensions to 1500 lbs. per conductor. Designed for very rough country work as well as general use; use with separate reel-carrying dolly or PENGO 6100 CT-RW.

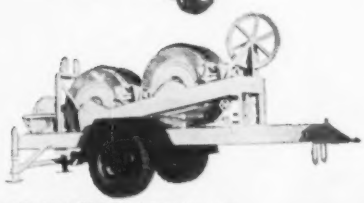
MODEL 6000 WS-TR strings one or two conductors to 1,272,000 CM. Tensions to 5000 lbs. per conductor. Complete trailer unit with reel-carrying devices, for general and medium-rough country use.



MODEL 6000 XHD-TR-I shown with snubbing brake. Strings one conductor to 1,272,000 CM. Tensions to 10,000 lbs.

(Below) **MODEL 7000 TR-I-72** (similar to 6000 XHD-TR-I, except larger) strings one conductor to 2" diameter. Tensions to 25,000 lbs.





MODEL 7000 TR-I-54 strings one conductor to 2" diameter. Tensions to 25,000 lbs. Extra sturdy, with 54" Bullwheels for low center of gravity – ideal for mountainous terrain.

List your requirements and send for descriptive literature and prices.

PETERSEN ENGINEERING CO., INC.
Santa Clara, California

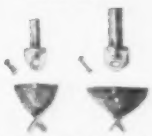
Other PENGO Products

Heavy Duty Double Helix Augers

Extra Heavy Duty Flight Augers (shown with gravel guards)

Offset Boring Heads

Heavy Duty Offset Boring Heads



Screw Bits for Small Holes

Pulling Eye

Screw Anchor Tool

Pole and Transformer chariot

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Santa Clara, Calif. Dept. G-6
Please send PENGO Tension-Stringing equipment data to:

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CITY_____ STATE_____

NOW—ALL THE HOT WATER

that any normal family will ever want—from a

40-GALLON TANK!

New Hotpoint SUPER-SPEED Water Heaters are *RIGHT* for 95% of your customers.

Here's tremendous hot water production in a bare minimum of space. Calrod® Magic Circle heat delivers 470 gallons of hot water every 24 hours... and it will raise 18 gallons 100° in just one hour. Even from a cold start, it will heat water for 3 shower baths in 25 minutes.

Hotpoint Quick-Recovery Water Heaters save space and simplify installation. And the new miracle MLC-7 additive in Perma-Seal models can increase the life of the tank by 200%!

SUPER-SPEED Water Heaters will help you put more POWER in "House-Power"—more LIVING in "Live Better . . . Electrically!"

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LOOK FOR THAT DIFFERENCE! (your customers do!)

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ELECTRIC RANGES • REFRIGERATORS • AUTOMATIC WASHERS • CLOTHES DRYERS • COMBINATION WASHER-DRYERS
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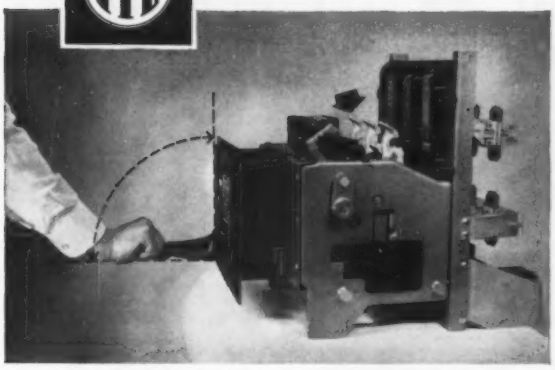
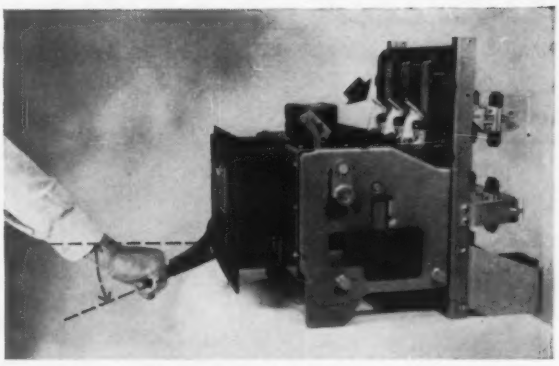
K-LINE LOW VOLTAGE SWITCHGEAR





Only I-T-E has manual quick-make operation available in 225 through 1600 amp rating

Only handle moves. Contacts are static during first 90% of pulldown handle travel. In this picture, arc chutes are removed.

Too fast for the eye. When stored energy mechanism passes crossover point, energy is released to close contacts within 5 cycles.

Only I-T-E has doors closed in all positions while racking

With breaker connected. Both power and control separable contacts are engaged.

In test position. Power contacts disconnected —control contacts connected.

Completely disconnected. Both power and control contacts fully disconnected.

Quick-make, manually charged closing feature and drawout with doors closed provide maximum safety for operator and circuit breaker

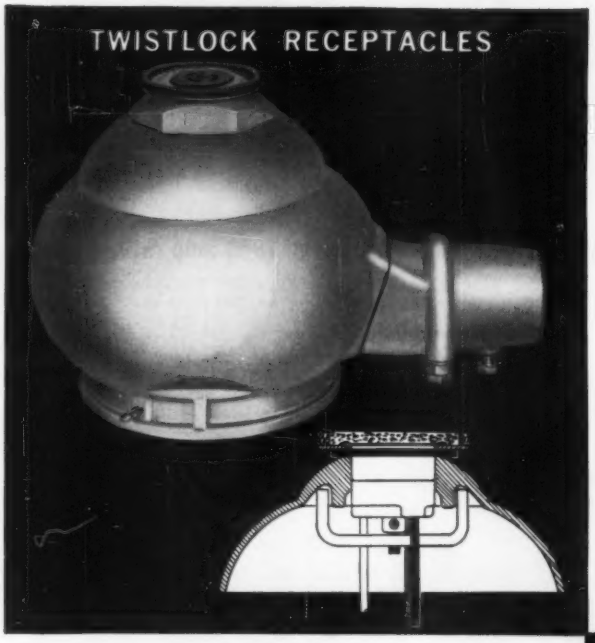
You can't tease and burn the contacts of the new quick-make K-Line of circuit breakers—the closing action is fast and positive. An ingenious stored energy mechanism does the job. It stores energy in the first 90% of the pulldown handle travel, releases it in the last 10%. Not until the crossover point is reached do the contacts move. And it closes in only 5 cycles—provides uniform closure every time. *More important, it is the only manually charged stored energy circuit breaker available that will close and latch against its short-time rating.* This means greater safety for the operator, less maintenance, and longer contact life.

You don't have to open the door to move the circuit breaker to test or disconnected position. The crank which operates the simple drawout mechanism fits into the escutcheon through a lift shutter. The shutter cannot be lifted while the breaker is closed. The breaker cannot be closed while the shutter is lifted. This means more than greater safety—you can forget the dirt problem; the nuisance of open doors impeding aisle travel; the risk of circuit breaker damage from exposure, even when completely out of service.

Bulletin 6004-C gives complete information about the new and safer I-T-E K-Line of low voltage switchgear. Contact your nearest I-T-E sales office for a copy. Or write Switchgear Division, I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada: Eastern Power Devices Ltd., Port Credit, Ont.

I-T-E CIRCUIT BREAKER COMPANY
PHILADELPHIA, PENNSYLVANIA

Wheeler HAS A New Twist on Receptacles



Wheeler street lighting heads are now available with the new proposed EEI-NEMA twistlock receptacle for all photo-electric lighting controls having the Hubbell twist-lock plug in the base. Other type receptacles also available.

The new Wheeler twistlock receptacles not only meet but far exceed EEI-NEMA electrical test requirements. In addition, they are by far the easiest to adjust, with one strong #10 setting screw taking the place of two weak #6 screws ordinarily used, thus being far superior mechanically to any other type.

Orientation to north may be obtained by loosening the screw in the center of the twistlock receptacle and rotating adaptor plate. The internal yoke design gives positive gripping action when screw is re-tightened, with this important safety feature — the Bakelite body cannot be crushed no matter how much the central screw is tightened.

Wheeler twistlock receptacles can be installed in standard heads having a 1¼" iron pipe size top tap. They are readily interchangeable with other makes which are built to screw into 1¼" pipe threaded openings. The top tapping may have to be reamed out slightly to receive the receptacle but does not require major machine shop alterations as do other receptacles.

Another Wheeler feature is the new gasket arrangement which provides stability and resistance to vibration never before available. With these new twistlock receptacles, Wheeler has achieved a construction which, for the first time, approaches reasonable standards of mechanical security and weather tightness.

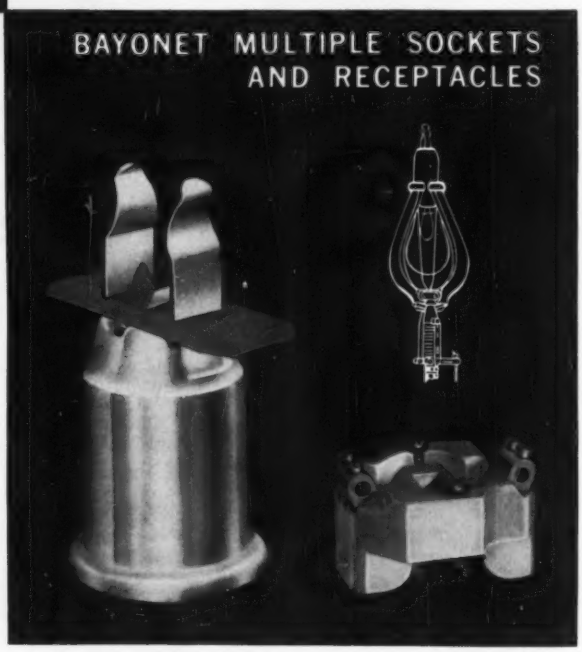
...and the Bayonet line most in demand!

Engineered for service! Series and multiple sockets *cannot be interchanged accidentally!* No short-circuits or open-circuits with Wheeler equipment. Available with either medium or mogul base, these sockets permit easiest multiple lamp changing yet with standard pole lamp remover.

These proven sockets are furnished with insulated shells of white porcelain, or black bakelite. White porcelain shells are preferred for large lamps in enclosed luminaires. Bakelite shells are preferred in open luminaires up to 2500 lumens because of exposure to breakage. All sockets have heavy bayonet prongs, well separated to avoid short circuits, that will withstand high temperatures without annealing. Skirts extend down sufficiently to allow easy removal either with gloved hand or with pole lamp remover.

Companion Wheeler Multiple Bayonet Receptacles are designed to receive all corresponding standard bayonet sockets and will center, orient, and grip them securely with ample pullout resistance. All receptacles are constructed on exceptionally heavy porcelain blocks for maximum mechanical strength. All terminals have twin binding screws.

Important! The Wheeler Multiple Bayonet Receptacle will take *any* Wheeler Multiple Bayonet Socket.



Contact your Wheeler representative or write . . .

Wheeler Represents the most advanced engineering in Street Lighting

Wheeler REFLECTOR COMPANY *(Street Lighting Dept.)*

(DIV. OF FRANKLIN RESEARCH CORP.) 275 CONGRESS ST., BOSTON 10, MASS.

Exclusive Canadian distributors—James R. Kearney Corporation of Canada, Guelph, Ontario.

Here are the **NEW GUYS** they're all talking about!

Men who are using the new Copperweld* Type M Guy Strand are already praising its two major features: Economy and Convenience. Through research and new production techniques, it is possible to market Type M at new low prices, yet retain the high quality standards of Copperweld. Consequently, your initial investment is minimized. As for yearly maintenance, it is a long-established fact that there is practically no upkeep with Copperweld.

Pliable and easy to handle, Type M Guy Strand can be readily bent, served, moused or clamped. The thick, ductile copper sheath of each wire will not crack, flake or peel because it is inseparably molten-welded to the steel core.

Write us today for complete details. Our field engineers will be glad to explain the advantages of Type M to you.

Trade Mark

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

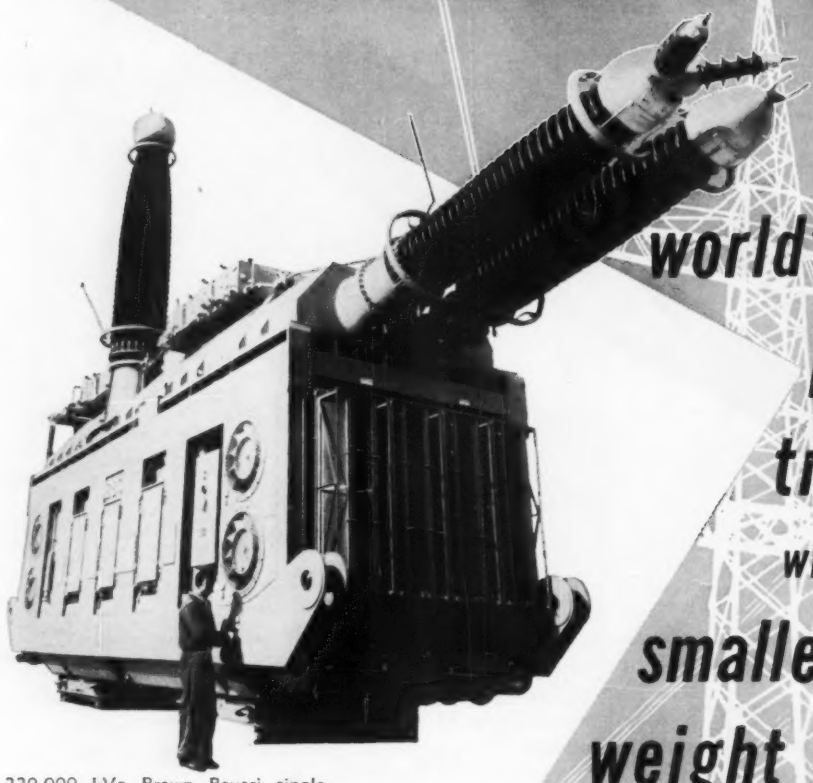
New Copperweld TRADE MARK

TYPE M GUY STRAND

2.2M 4M 6M 8M 10M 12.5M 16M

400 KV

660,000 KVA IN A 3-PHASE BANK



220,000 kVa Brown Boveri single-phase autotransformer, BIL 1450 kV, 400/230/30 kV with TCUL regulation ± 18% on 230 kV side.

world's largest power transformer with the smallest weight per kVA

EACH single-phase, Schnabel-car-designed-unit weighing 441,000 lbs. (including oil) was shipped completely assembled with coolers except for the high voltage bushings which were removed for transport. Two days after arrival of the transformers they were ready for energization.

In successful operation since Oct. 1957, these transformers are an important addition to Brown Boveri's vast experience in designing and manufacturing transmission equipment for 400 kV and higher system voltages of the future.

Write for further information.

BROWN BOVERI

BROWN BOVERI CORPORATION

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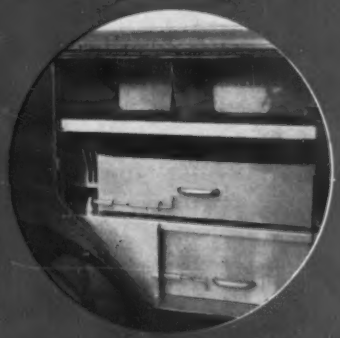
YH

CREATIVE ENGINEERING FOR
THE PUBLIC UTILITY INDUSTRY
SINCE 1892

this is the latest design 20IU76 BODY

Illustrating YORK-HOOVER CONVENIENT SPARE WHEEL SLIDING SHELF. Can also be used for additional tool or material carrying compartment.

Illustrating NEW YORK-HOOVER EXTRUDED NEOPRENE GUIDES for overhead ladder brackets that prevent chafing wear on ladder rails.



Illustrating NEW YORK-HOOVER EXTRUDED NEOPRENE DOOR SEALS —more durable than sponge rubber— also prevents doors freezing to seals in cold weather.

THESE FEATURES MAKE THE YORK-HOOVER 20IU76 SERVICE BODY *THE LATEST*

Yes, these and many more *cost-saving features* including—lightweight, yet rugged construction—adjustable, partitioned drawers—and flush type, paddle handles—make the York-Hoover 20IU76 Service Body the latest in *design*—*construction*—in overall *efficiency.* Write for complete details today! Make sure *you* have the latest design 20IU76 Service Body—the *York-Hoover* 20IU76.

CLIP AND MAIL TODAY!

Dept. 2E, York-Hoover Corporation
York, Pa.

Please send me a copy of Bulletin No. 937 covering your 20IU76 Service Body.

Name_____

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GET GOLD SEAL RUBBER TAPE *for easy handling and instant fusing*

Here's the tape for high voltage insulation! Easy to work with, Gold Seal Rubber Tape fuses together instantly, provides long-life insulation protection. With its high dielectric strength and ability to conform to irregular shapes, Gold Seal makes a perfect insulating splice. Jenkins Bros., Rubber Division, 100 Park Avenue, New York 17.

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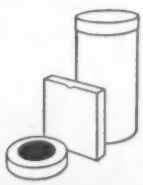


In 10-roll containers or single rolls. Each roll sealed in cellophane, stays fresh.

1948—*Early "point contact" transistor.*

The remarkable transistor observes its 10th birthday

In 1948, Bell Telephone Laboratories announced the invention of the transistor. In 1958, the transistor provided the radio voice for the first United States satellite.

To advance the transistor to its high level of usefulness, Bell Labs had solved problems which, in themselves, approached the invention of the transistor itself in scientific achievement.

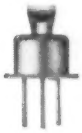
First, there had to be germanium of flawless structure and unprecedented purity. This was obtained by growing large single crystals—and creating the "zone refining" technique to purify them to one harmful part in *ten billion.*

The "junction" transistor, another radical advance, spurred transistor use. Easier to design, lower in noise, higher in gain and efficiency, it became the heart of the new electronics.

An ingenious technique for diffusing a microscopically thin layer on semiconductors was created. The resulting "diffused base" transistor, a versatile broadband amplifier, made possible the wide use of transistorized circuits in telephony, FM, TV, computers and missiles.

In telephony the transistor began its career in the Direct Distance Dialing system which sends called telephone numbers from one exchange to another.

For Bell System communications, the transistor has made possible advances which would have been impossible or impractical a brief decade ago.

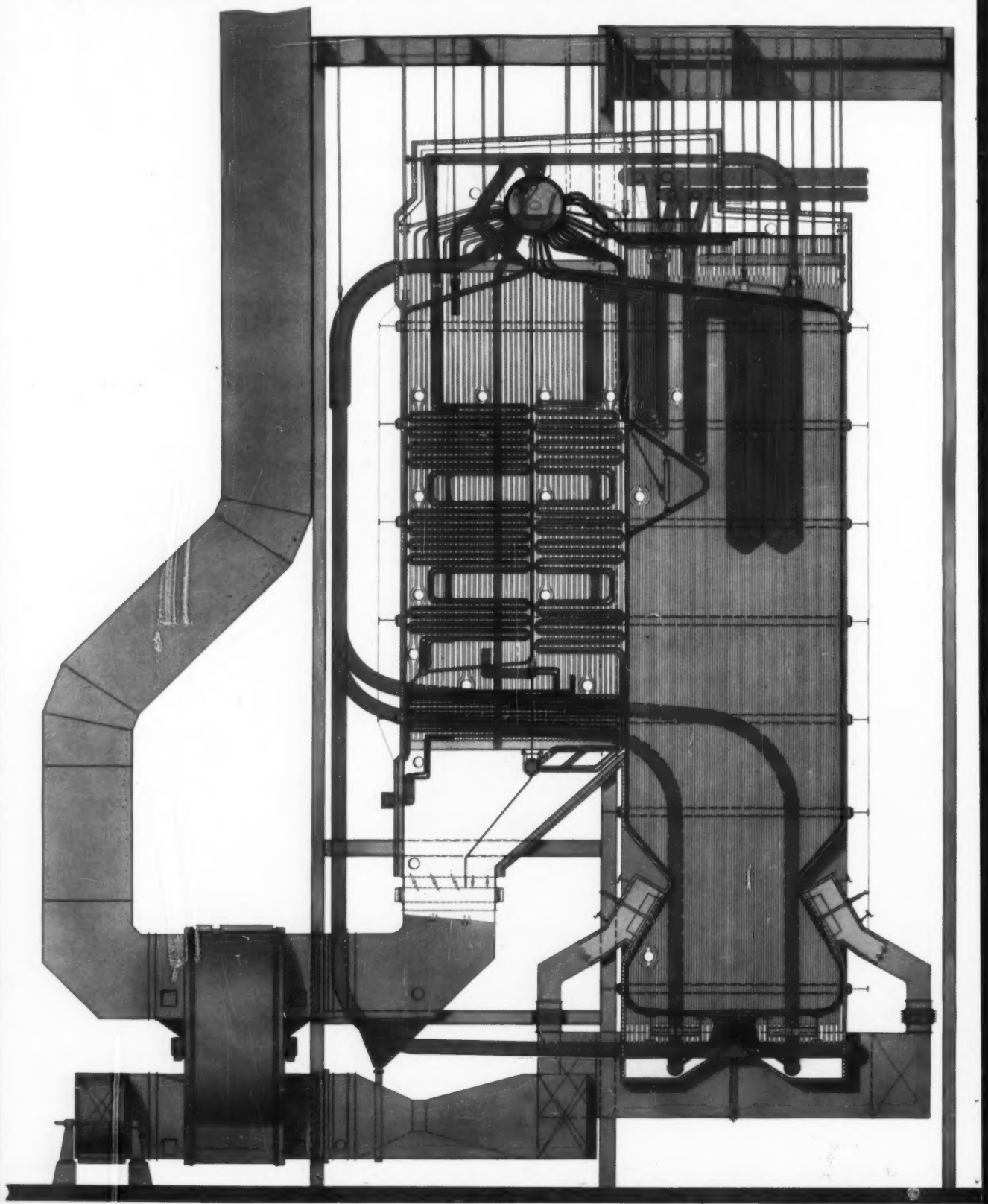


1958—*Satellite transistor, incorporating 10 years of Bell Labs research and development.*

BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

Two RILEY TURBO FURNACE Reheat Units



1,550,000 lbs/hr — 2125 psig — 1005/1005 — TURBO FURNACE Fired by Natural Gas, Future Oil or Pulverized Coal
Ebasco Services, Inc., Consulting Engineers

To Generate 3,200,000 Lbs/Hr of Steam For Louisiana Power & Light Company

The 1,550,000 lb/hr unit, left, is now in operation at Sterlington Steam Electric Station. The second unit, for Little Gypsy Steam Electric Station, with a capacity of 1,650,000 lbs/hr, is designed to burn coal.

Now operating at Sterlington Steam Electric Station at Sterlington, La. is the first of two Riley TURBO FURNACE units ordered by Louisiana Power & Light Company. The selection of the TURBO FURNACE was dictated by the changing regional fuel picture.

The Riley TURBO FURNACE is basically a multifuel unit. Installed initially as a gas and oil fired unit, as at Sterlington Station, conversion to solid fuels can be made with only minor changes such as the addition of coal pulverizers. The characteristic of the TURBO FURNACE that makes this possible is, that regardless of the fuel burned, the furnace exit gas temperatures are approximately the same.

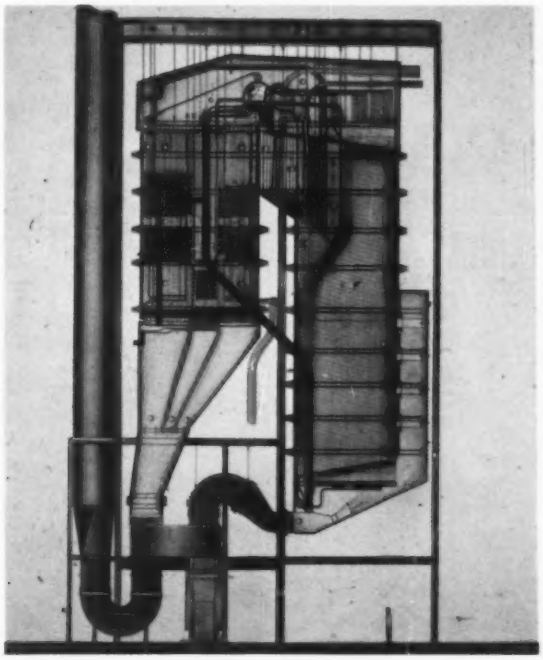
A survey of your plant by a qualified consulting engineer could show ways of making surprising savings in your power costs.

Other advantages of these TURBO FURNACE units are: when firing coal, elimination of slagging on furnace walls, a minimum degree of carbon loss because of long residence time of fuel in the combustion chamber; also, one level burner operation, and, a lower overall height of structure compared with a conventional boiler of similar size.

For more detailed information on Riley TURBO FURNACE Units write *Riley Stoker Corporation, Worcester, Mass.* Offices in these principal cities: Atlanta, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Kansas City, Los Angeles, New Orleans, New York, Philadelphia, Pittsburgh, Portland, St. Louis, St. Paul, Salt Lake City, San Francisco, Seattle, Worcester.

RILEY

STEAM GENERATING & FUEL BURNING EQUIPMENT



This is the 1,000,000 lbs/hr Riley Reheat Unit at Louisiana Power & Light's Nine Mile Steam Electric Station
Ebasco Services, Inc., Consulting Engineers

In town or country . . .

street lighting with

General Electric's

POWER GROOVE LAMPS

makes everybody look good

. . . especially the engineer who recommends them!

New G-E Power Groove fluorescents give twice as much light for safer night driving as the same number of ordinary fluorescents. What's more, they provide seeing comfort with natural color rendition. People look like people—and that's good.

There's a big savings in original cost, too, and a continuing savings in maintenance expense for equal light. This makes *everybody* look good!

WHEN YOU PLAN YOUR HIGHWAY LIGHTING AROUND G-E POWER GROOVES:

1 You get more light from the same number of lamps and luminaires, or

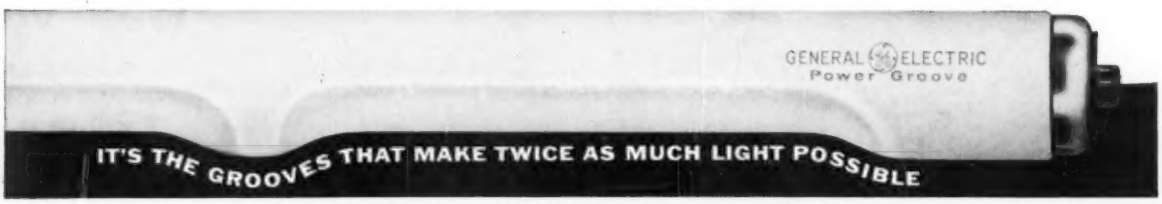
2 You use fewer lamps and luminaires and get equal light, or

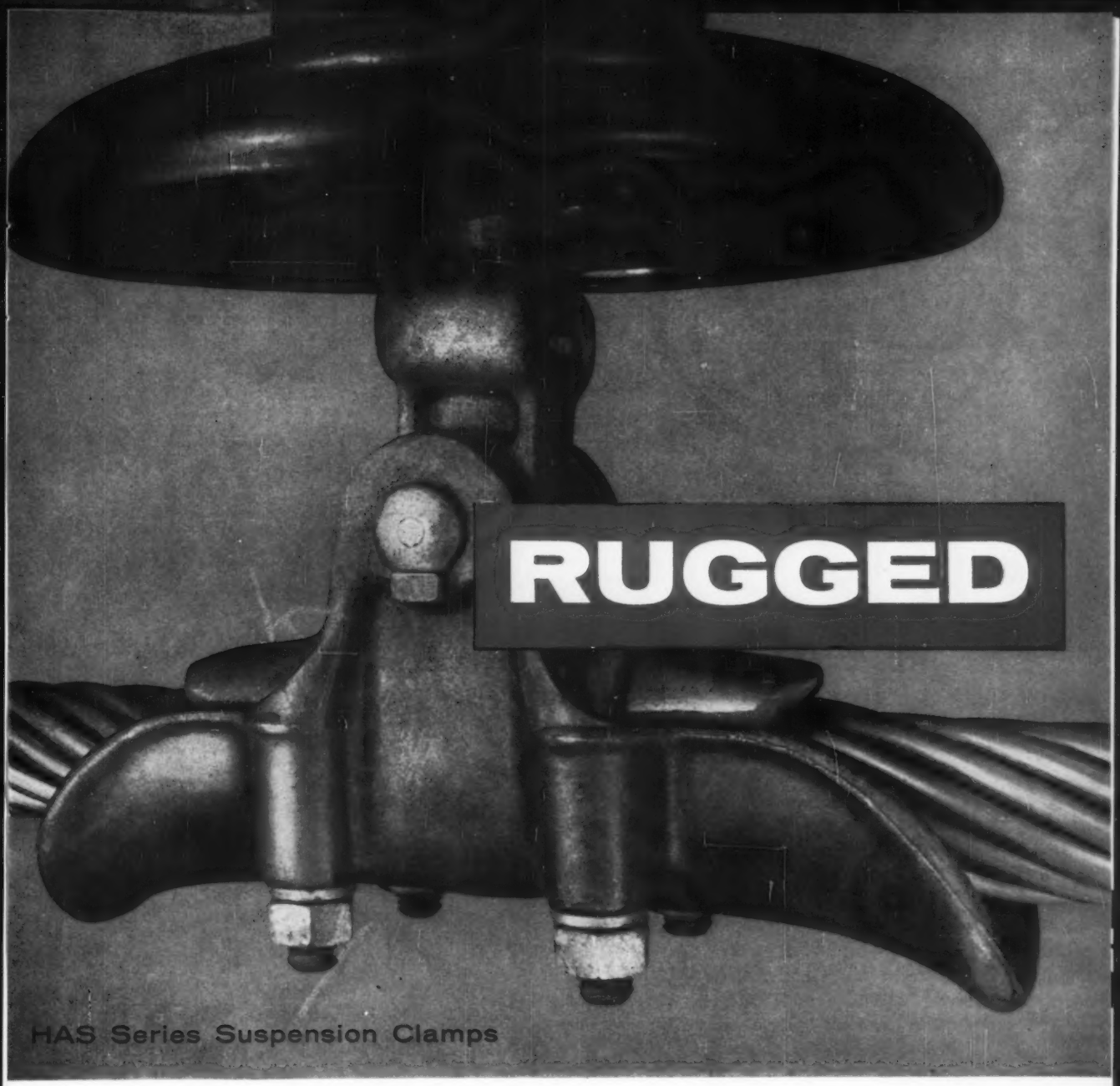
3 You use the same number of shorter lamps and luminaires and get equal light.

G-E Power Grooves provide good roadway visibility, especially on wet pavement. So use them for parking and service areas, toll plazas, tunnels and underpasses, and on main or arterial highways through cities and towns. For more information on G-E Power Groove fluorescents or mercury lamps for street and highway lighting, write: General Electric Co., Large Lamp Dept. C-828, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC





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Proven rugged by long service in utility systems throughout the world! Cast from high strength, non-corrosive aluminum alloy. Light weight reduces conductor damage . . . flared mouth design prevents chafing. Engineered for minimum hysteresis and eddy current losses. Clevis pin locked against rotation. Speed cotter key facilitates maintenance while energized.

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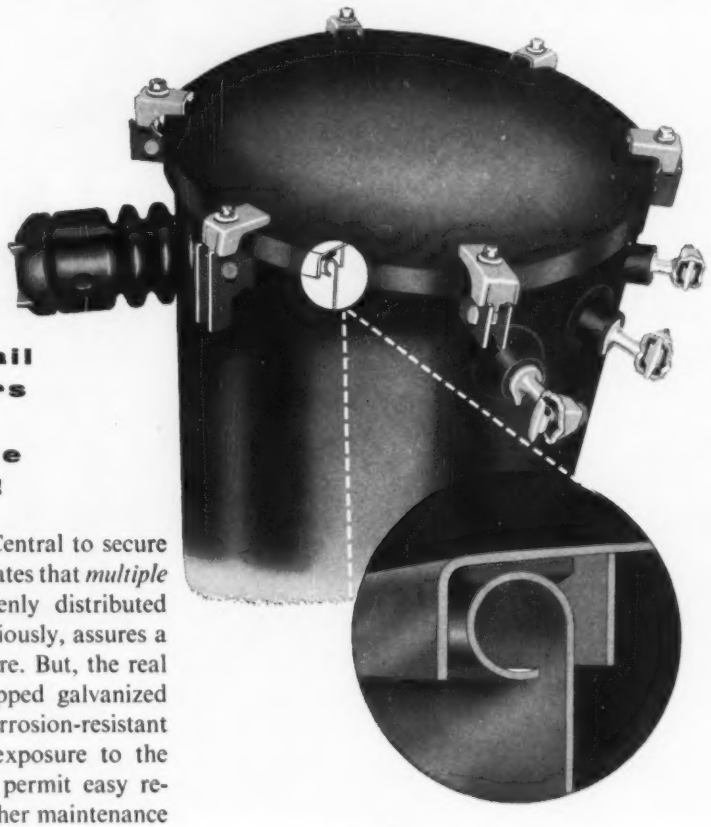
Research / Quality / Performance / in Aluminum and Bronze Products

Aluminum and Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATION • TRANSMISSION • DISTRIBUTION

FROM TOP TO BOTTOM, INSIDE AND OUT CENTRAL TRANSFORMERS ARE BUILT FOR SERVICE

Every step of the way!

Every Design Feature, Every Engineering Detail Of Central Transformers Have One Objective... A Product That Will Give Better Service, Longer!



Take, for instance, the method used by Central to secure the transformer cover. Common sense dictates that *multiple* clamps will permit a tighter, more evenly distributed pressure on the gasket. This method, obviously, assures a more positive seal against air and moisture. But, the real PLUS feature here is the use of hot-dipped galvanized steel clamps held in place by special corrosion-resistant brass alloy bolts. Even after years of exposure to the elements, these corrosion-resistant bolts permit easy removal of the cover for tap changing or other maintenance operations. It's the small but important details such as this that set Central Transformers in a quality class by themselves.

We Design and Manufacture Quality Transformers —Nothing Else!

Just one more reason why Central Transformers are **PREFERRED** *throughout the Nation*

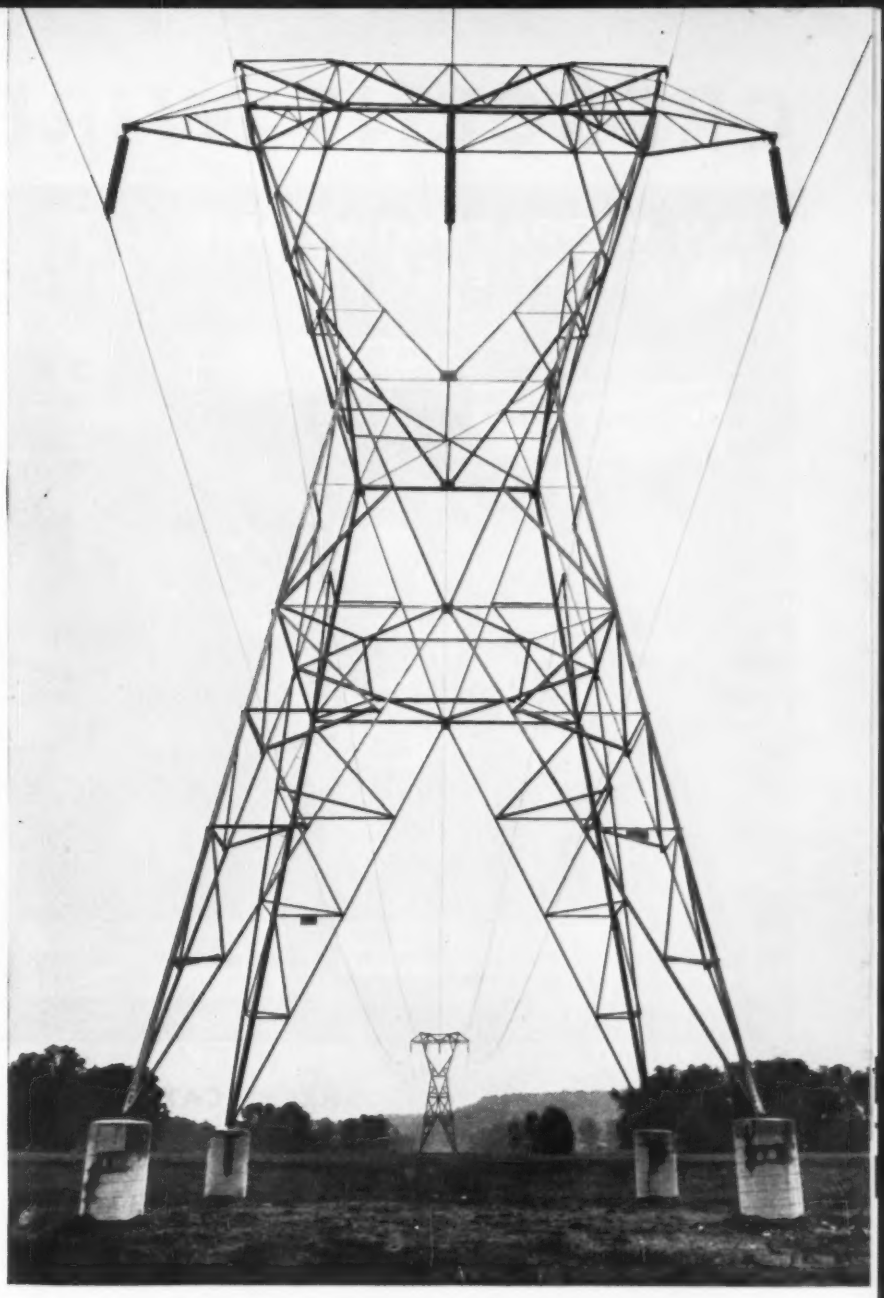
Central
TRANSFORMER CORPORATION

PINE BLUFF, ARKANSAS
Telephone JEfferson 4-5332

Sales Offices in Principal Cities

NEMA

To withstand severe flooding in the Brandywine Creek area, over three miles of towers were designed with special foundations.



Philadelphia Electric uses 110 Blaw-Knox Towers to bring more power to Delaware County

From Bradford to Chichester—that's the route of Philadelphia Electric's new nineteen mile line. Carrying 220,000 volts, the new line will bring increased power to the highly industrialized lower Delaware County area.

Working as a team, Philadelphia Electric and Blaw-Knox engineers designed new light-weight towers to support three 795,000 CM ACSR conductors and two 134,600 CM ACSR groundwires.

Combining specific tower requirements with solid concepts of good tower design has been a Blaw-Knox specialty for over 40 years. Backed by this extensive experience, these skillfully engineered towers are noted for outstanding structural design, simple field erection and easy modification.

Folder 2509 details this know-how in tower engineering and fabrication. Send for your copy and tell us your needs. We'll gladly give you our recommendations and a quotation.

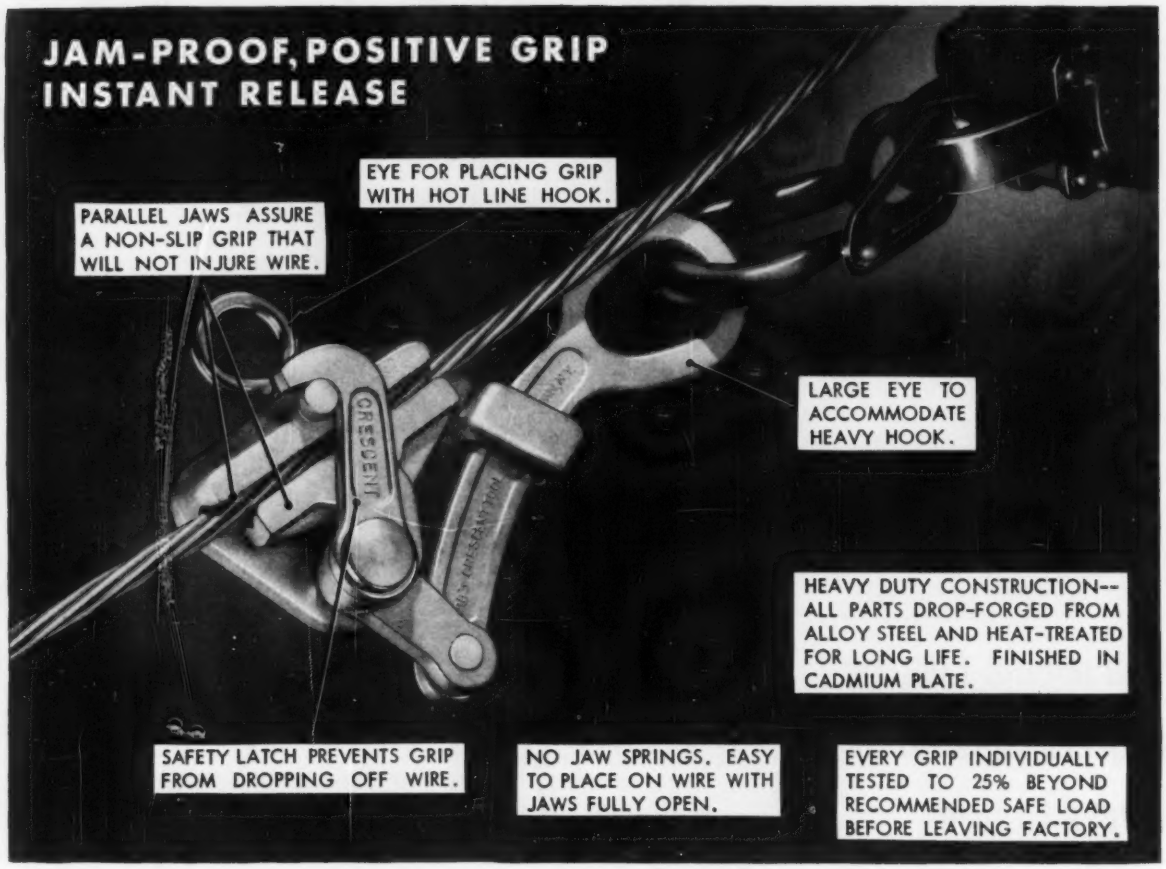
Transmission Towers—Steel Transmission towers, custom-built for each installation . . . multi-circuit and other special structures . . . and antenna towers, guyed and self-supporting types for AM • FM • microwave • communications • radar • parabolic antennas.

BLAW-KNOX

BLAW-KNOX COMPANY
Equipment Division
Pittsburgh 38, Pennsylvania

BK-4403

CRESCENT WIRE GRIPS


JAM-PROOF, POSITIVE GRIP
INSTANT RELEASE
EYE FOR PLACING GRIP WITH HOT LINE HOOK.
PARALLEL JAWS ASSURE A NON-SLIP GRIP THAT WILL NOT INJURE WIRE.
LARGE EYE TO ACCOMMODATE HEAVY HOOK.
HEAVY DUTY CONSTRUCTION-- ALL PARTS DROP-FORGED FROM ALLOY STEEL AND HEAT-TREATED FOR LONG LIFE. FINISHED IN CADMIUM PLATE.
SAFETY LATCH PREVENTS GRIP FROM DROPPING OFF WIRE.
NO JAW SPRINGS. EASY TO PLACE ON WIRE WITH JAWS FULLY OPEN.
EVERY GRIP INDIVIDUALLY TESTED TO 25% BEYOND RECOMMENDED SAFE LOAD BEFORE LEAVING FACTORY.
CRESCENT

SPECIFICATIONS

Number	*Maximum Capacity*	*Minimum Capacity*	*Safe Load*	*Eye Opening*	*Weight*
383 —Serrated Jaws	5/16 (.3125)" 8 mm.	—5/32 (.156)" 4 mm.	5,000 lbs. (2200 KG)	1-1/8" x 1-11/16"	1-3/4 lbs.
383-2—Same, except with smooth jaws for aluminum wire.					
384 —Serrated Jaws	1/2 (.500)" 12.2 mm.	—1/4 (.250)" 6.5 mm.	7,500 lbs. (3400 KG)	1-1/4" x 1-3/4"	3-5/16 lbs.
384-2—Same, except with smooth jaws for aluminum wire.					
385 —Serrated Jaws	3/4 (.750)" 19 mm.	—3/8 (.375)" 9.5 mm.	10,000 lbs. (4500 KG)	1-1/4" x 1-3/4"	4-7/8 lbs.
385-2—Same, except with smooth jaws for aluminum wire.					
386 —Serrated Jaws	1-1/16 (1.0625)" 27 mm.	—9/16 (.5625)" 14.5 mm.	12,500 lbs. (5600 KG)	1-5/8" x 2-3/8"	9 lbs.
386-2—Same, except with smooth jaws for aluminum wire.					

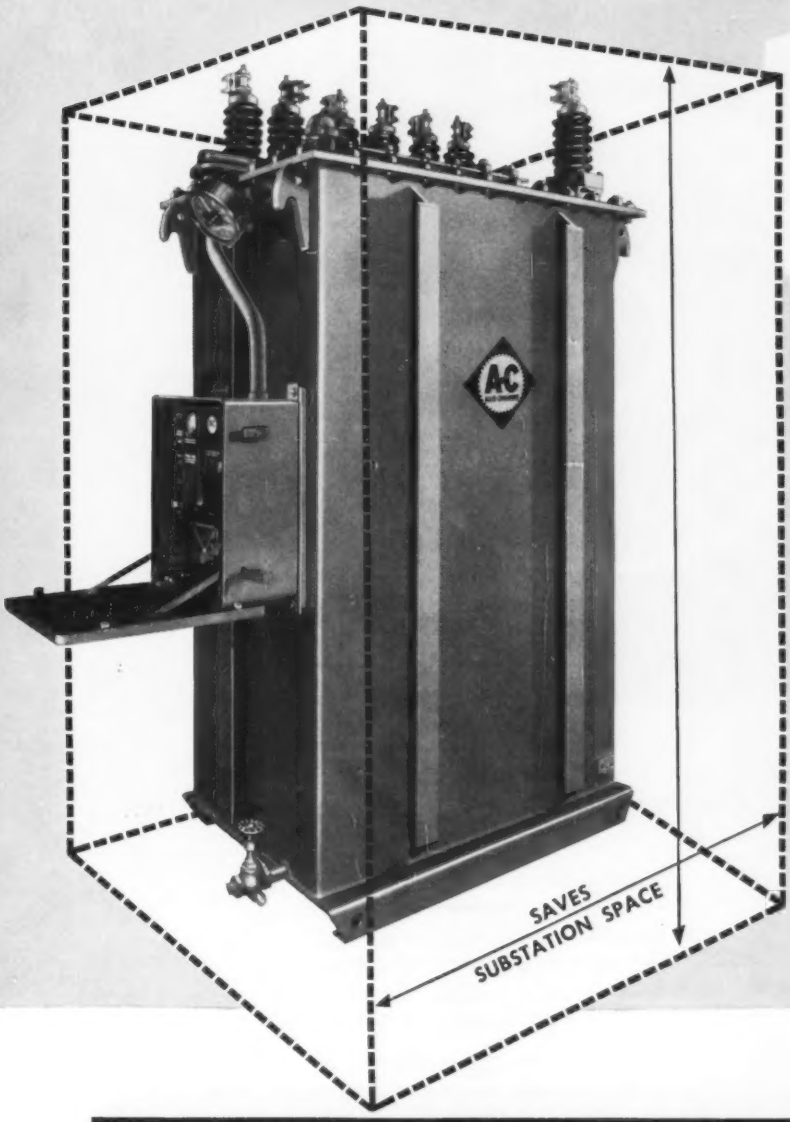
For bare and insulated wire, use serrated jaw style. For bare aluminum wire only, smooth jaws.

Write for Crescent Catalog which illustrates and describes many valuable tools for linemen and other electrical workers.

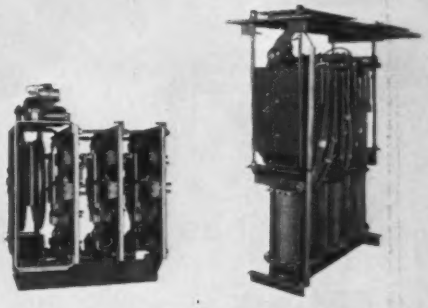
Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

Allis-Chalmers—25 years of leadership in 5/8% regulators



NOW save 33% space... 30% cost



Illustrations show heavy-duty tap-changing mechanism and unit construction combined with new space-saving arrangement of tap-changing mechanism.

NEW Allis-Chalmers 3-phase distribution regulators

Get these new benefits only with Allis-Chalmers new 3-phase distribution regulators:

- 33% less space required for distribution regulators in substation.
- 20% less weight for easier handling, lower installation costs than ever before.
- 30% less cost per kva of 3-phase regulation.
- 160% *Vari-Amp* rating is now provided to 600 ampere maximum.

Available in most popular ratings as follows: 500 and 750 kva, 8660 v; and 500, 750 and 1000 kva, 13,200 v.

The important savings offered by these new units warrant re-evaluation of your present substation planning.

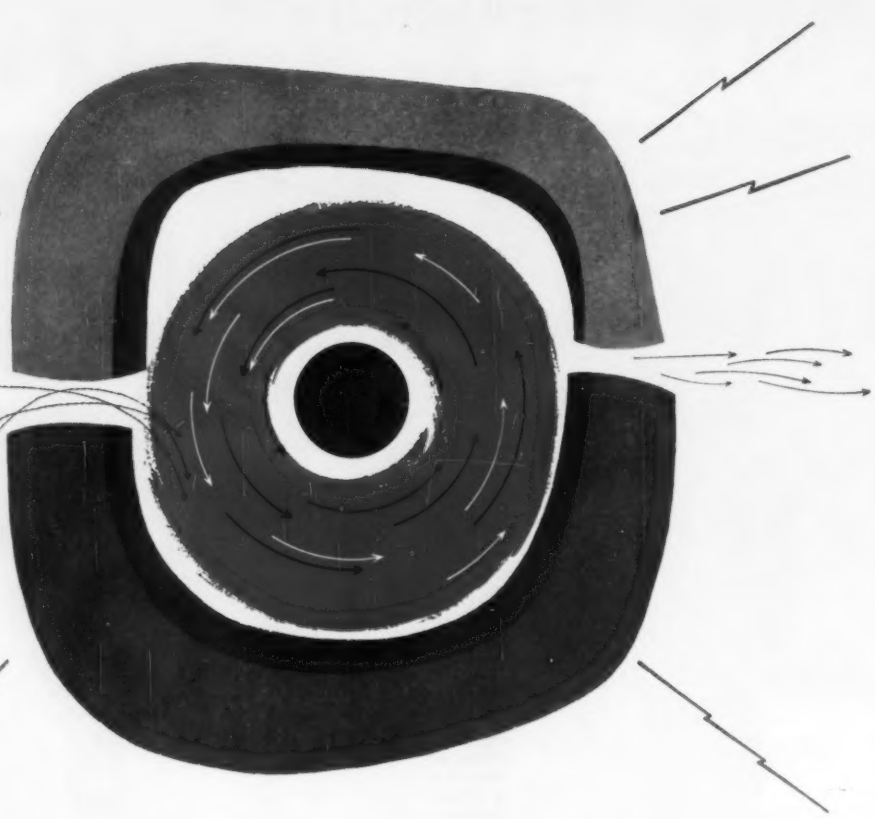
Check with your nearby A-C office or contact Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Originators of 5/8% Step Regulators

ALLIS-CHALMERS

A-5768

INGENUITY



has made KE a major builder of power facilities

A 475,000 KW power generating facility, engineered and built by KE.

Faster construction, more efficient operation, lower costs—these are benefits Kaiser Engineers' ingenuity has brought to power projects ranging from America's largest dam to power installations for industrial plants.

Experienced KE engineers can take your power idea from a gleam in your eye through start-up—from economic analysis through operator training.

Whether your future power needs are thermal or nuclear, call KE. Let KE's ingenuity produce real time and money savings for you.

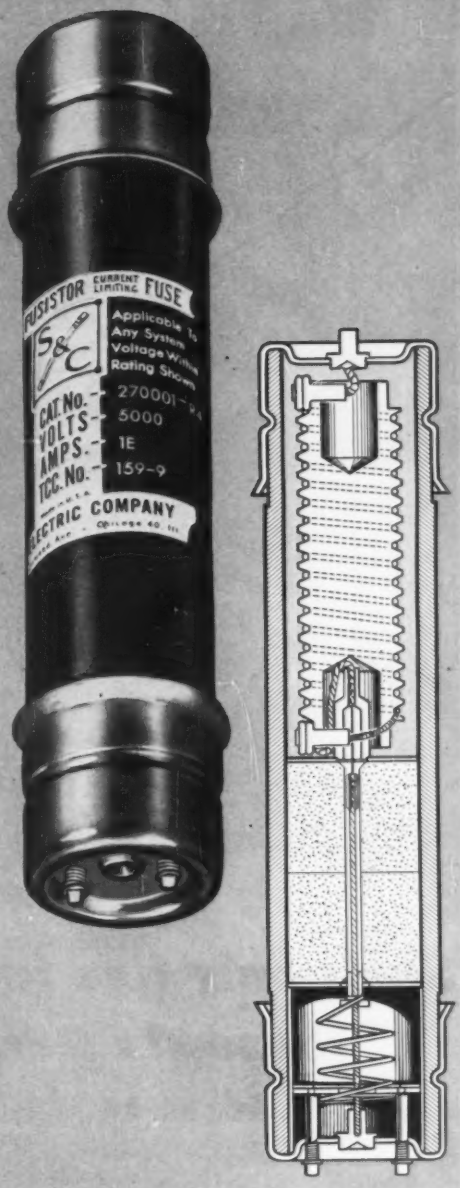
KAISER ENGINEERS engineers—contractors
Contracting since 1914

Division of Henry J. Kaiser Company • Oakland 12, California • New York, Pittsburgh, Washington, D.C., Buenos Aires, Calcutta, Dusseldorf, Montreal, Rio de Janeiro, Sydney, Tokyo

4381

for potential transformers...

S&C's new Fusistor, a universal current limiting fuse



UNIVERSAL because it is not critical as to system voltage. For example, the 14.4 kv Fusistor will take care of all system voltages down to 2.4 kv without impairment of its interrupting ability, and without inducing excessive transient overvoltages during interruption. Contrast this with other current limiting fuses which must be applied between 70% and 100% of nameplate voltage rating.

UNIVERSAL because it fits all mountings, regardless of make. And just two ratings (different clip centers) will take care of most indoor potential transformer protection needs at 14.4 kv and below. There's no need to stock a rating for each system voltage.

HERE'S WHY: The Fusistor interrupts faults even at voltages substantially below its rating because of the inherent operating characteristics of its current limiting section (upper half of cutaway drawing, right). It uses helically coiled molybdenum wire, in turn helically coiled on a ceramic core, embedded in silica sand. Molybdenum has a high resistance even under normal conditions, and when fault current flows, its resistance increases rapidly. Thus, the Fusistor responds immediately to the fault, and—because of molybdenum's high melting temperature—its current limiting action continues longer. And when the molybdenum does melt, there is a less pronounced "chopping" of the current.

In the lower half of the Fusistor is a separate circuit interrupting section. Using time-tested boric acid, it *positively* interrupts even the lowest faults. And on maximum faults, both sections combine to limit and interrupt the current. The Fusistor thus gives positive protection over the full range of fault currents.

Fusistors rated 4.8 kv and higher have two plunger indicators (shown at the bottom of both views) which drop down to show that the fuse has blown.

S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Rd., Toronto 14, Ont.

Power Fuses
Distribution:—
Disconnects
Cutouts
Fuse Links
Loadbuster
Load Interrupters
Metalclad Switchgear

S&C ELECTRIC COMPANY

Part of the Permutit Precipitator-filter-demineralizer plant treating 2 million gallons of water per day at West Virginia Pulp & Paper Company, Charleston, S. C.

She's only five foot two, but she "operates" these six Permutit Valveless Filters

• If these were standard manually-operated gravity filters, it would take 3 husky well-trained men (3 one-man shifts) to open and close heavy valves for shutoff, backwash and rinse. If they were table-controlled automatic filters, the initial cost would be almost *doubled.*

Fact is these filters are in the same price range as manual filters, yet they are *completely automatic.* They shut themselves off from service at just the right bed condition. They backwash and rinse at the most efficient flow rates and for a pre-set length of time. Then they put themselves back into service. The little lady doesn't have to touch them!

Permutit Valveless Filters use a simple design employing basic hydraulic principles to do the "thinking" and the work . . . replacing expensive valves, flow controllers and hydraulic or pneumatic control systems. Initial installations have been approved for treatment of drinking water as well as process water.

Our new Bulletin No. 4351 tells how you can cut both initial and operating costs with Valveless Filters. Call the nearest Permutit man or write to The Permutit Company, Dept. EW-8, 50 West 44th Street, New York 36, N. Y., or Permutit Company of Canada, Ltd., Toronto 1, Ontario.

PERMUTIT®
rhymes with "compute it"
a division of PFAUDLER PERMUTIT INC.
Water Conditioning
Ion Exchange • Industrial Waste Treatment

RT&E

Concentration on distribution transformers only has led RT&E to superior engineering achievement in every phase of transformer development.

One outstanding example of such achievement is clearly evident in R T & E transformer insulation. Because insulation is so important in over-all transformer performance, R T & E impulse withstand levels exceed NEMA requirements by as much as 50%. In addition, R T & E transformers can be safely overloaded without exceeding NEMA temperature rise limitations.

engineering talent concentrated on transformer

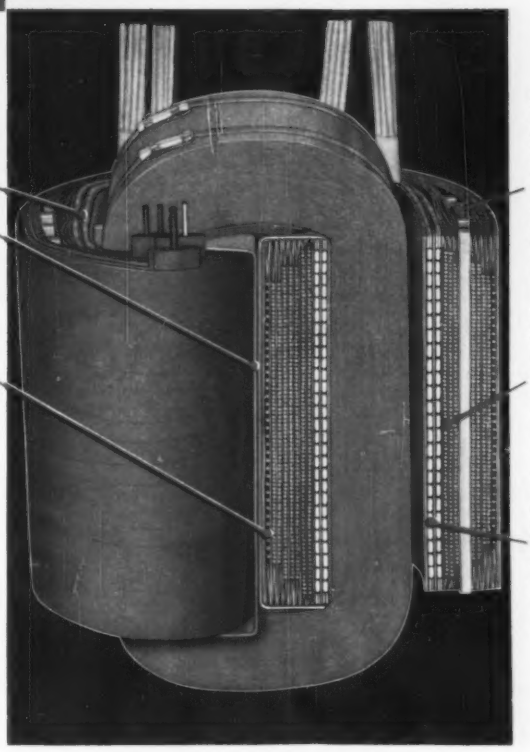
insulation

assures higher overload capacity, extra surge strength

COIL LAYER INSULATION
A minimum of two sheets per layer of high grade 100% pure Kraft electrical paper is used. Thickness choice is such that a maximum stress of 30 volts per mil thickness is attained at high stress points. Major insulation is used as a barrier between primary and secondary windings. Heavy transformer board is used as a barrier between secondary windings and the core.

SURGE PROTECTION
All coils are protected against lightning and switching surges. This is accomplished by means of a space wound layer which resists turn to turn failures and by stepping back the end turns of coil layers and locking them in place with folded paper insulation. This provides a high factor of safety in creepage distances and offers a high resistance to winding to ground or secondary lightning punctures.

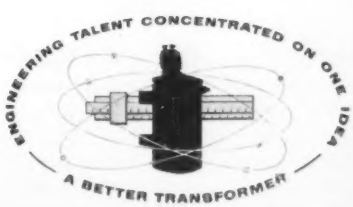
VARNISH
To further enhance the mechanical and electrical strength of the coil, it is immersed in a high solids, high mechanical strength thermosetting varnish that will not soften, dissolve, or affect the cooling oil. After thorough penetration by this varnish, the coils are baked to assure complete curing of varnish and to remove moisture. Final coil drying is done under heat and vacuum in the transformer tank before the oil is added.



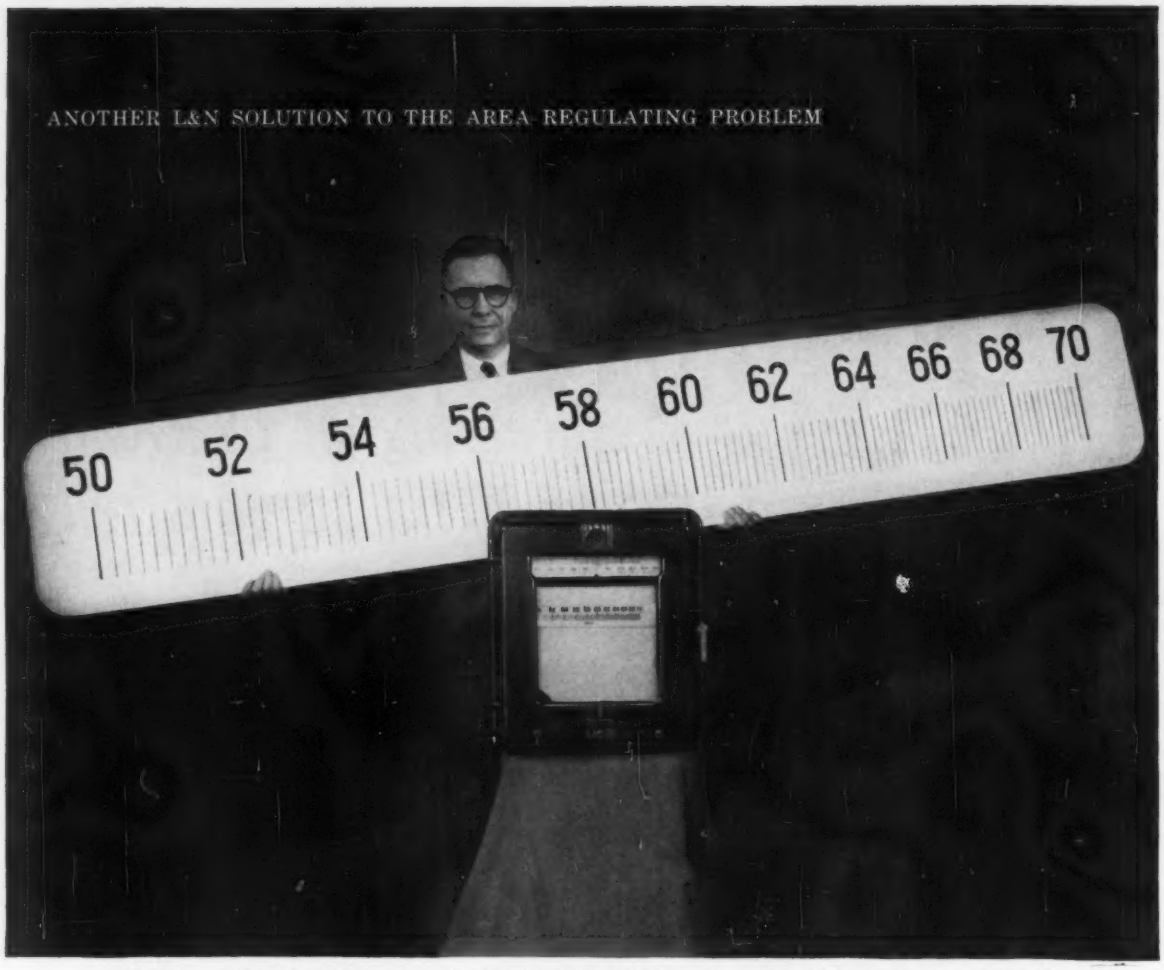
INHIBITED OIL
The finest mineral oil, inhibited with DBPC, is used in all R T & E transformers, but only after it has gone through a special drying and filtering process to maintain a dielectric strength of at least 30,000 volts breakdown when tested according to ASTM standards.

TURNS INSULATION
Primary (high voltage) turns are round-wire, insulated with heavy Formvar which has excellent electrical properties, resistance to bending abrasion and heat, and is chemically stable.

Secondary (low voltage) turns use rectangular or square conductors, and are either double cotton or ¾ lap paper insulated. This insulation has excellent varnish absorption qualities which enhance the mechanical and insulating qualities of the coil.



RT&E CORPORATION
WAUKESHA, WISCONSIN • PORTLAND, OREGON



T. H. Bean, L&N Load-Frequency Control Specialist, holds mock-up of an eight-foot-wide scale which would be required on a single-range, 50-70 cycle frequency recorder to provide desired readability near 60 cycles. The new Speedomax® Dual Range Recorder gives required legibility by utilizing dual ranges of 59.5 to 60.5 cycles, and 50 to 70 cycles, nominal.

New Dual-Range Frequency Recorder Combines ±½ & ±10-Cycle Scales

By T. H. Bean, Leeds & Northrup Company

• Power system operators have long regarded the ideal frequency recorder as one which would make even 0.006-cycle swings easily discernible, and at the same time, accommodate emergency frequency excursions ranging from 50 to 70 cycles. New L&N recorders combining these characteristics are now in operation on several power systems.

The new recorders (Speedomax Type G) operate on a narrow, ±½-cycle scale under normal conditions so that an 0.1-cycle bandwidth covers a 1″ segment of the chart. Whenever a system upset drives frequency beyond the narrow range, the instruments automatically transfer to the wide, 50-70 cycle range.

Use of a Wein bridge in the measuring circuit provides inherent stability without the need for separate, external primary elements. The new recorders are designed with ample reserve balancing torque to accommodate control devices, making them well suited for integration with planned, or existing, load-frequency control systems.

To get all the facts, we suggest you talk with the men at your nearest L&N District Office, or write to 4938 Stenton Avenue, Philadelphia 44, Pa., and ask for Preliminary Technical Publication 461-32.

New Holan Digger has 3 Speeds...

For Tough Terrain

Holan digger burrows into rocky ground at approximately 27 r.p.m. Torque is approximately 4,000 ft.-lbs. Low-speed, high-torque is used for tough terrain and for larger augers—16″ to 30″ diameter. Notice digger head which houses vane-type hydraulic motor and floating planetary gearing.

For Normal Conditions

Here, with good digging, speed is approximately 80 r.p.m., torque about 1,300 ft.-lbs. Normal-speed, low-torque is also used for augers 16″ or less diameter. New Holan digger digs holes deeper than 10 ft.

For Spin-Off

Operator pulls cord and digger revolves at up to 260 r.p.m. to spin off dirt evenly around the hole. All controls are located in one spot at the rear of the truck.

Positioning cylinder on power feed attachment corrects travel arc of derrick. It also provides more clearance while setting poles—and makes possible straighter holes and angle digging for anchor holes, as shown here.

J.H. HOLAN® CORPORATION

4100 WEST 150TH STREET
CLEVELAND 35, OHIO

OTHER PLANTS:

HOLAN CORPORATION OF GEORGIA, Griffin, Ga.

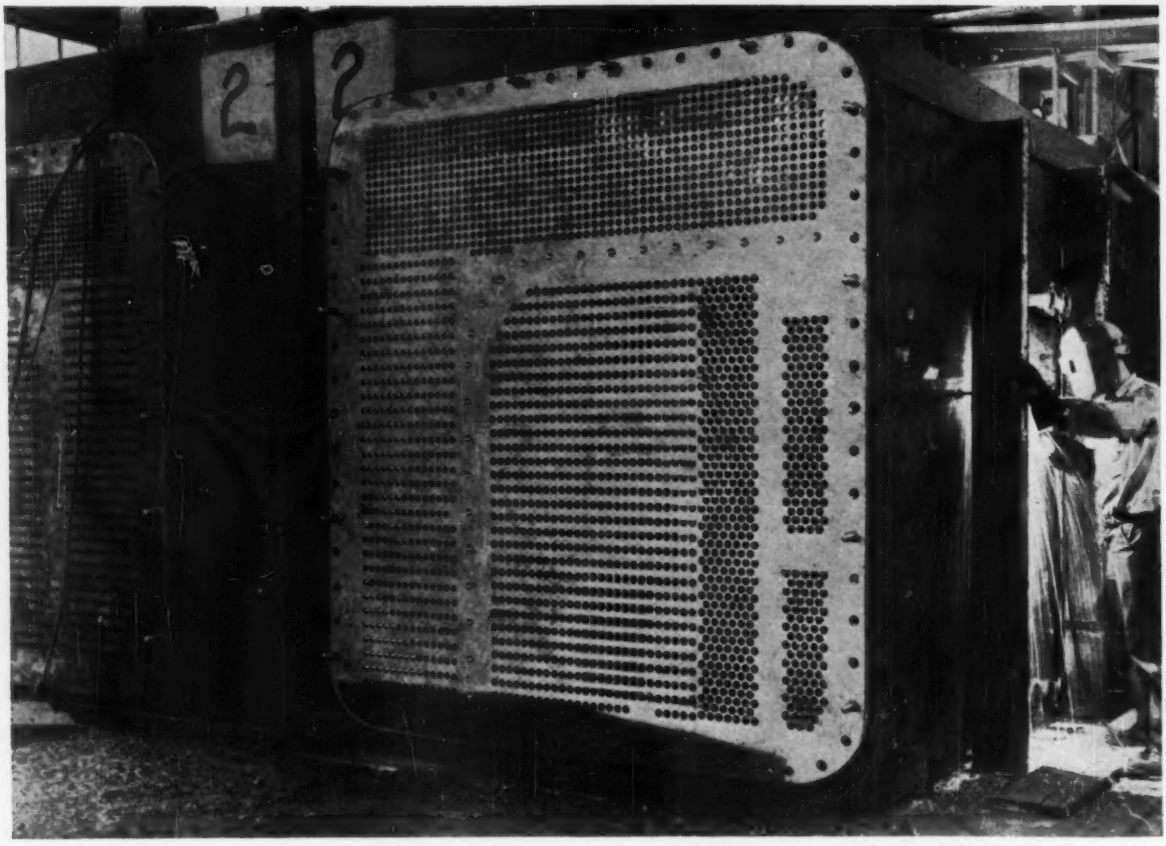
J. H. HOLAN CORPORATION, PHOENIX DIV., Arizona

BRANTFORD-HOLAN LIMITED, Brantford, Ontario

THE NAME THAT MEANS WORK SIMPLIFICATION

Spin speed operable in normal or low speed . . . semi-automatic gear shifting operation . . . uniform tooth loading with floating planetary gearing . . . splash-type lubrication.

For more information, write and ask us about the new Series 5400 Multiple-Speed Earth Borer.



C.H. Wheeler Reverse Flow Condenser prior to installation at Savannah Electric & Power Company's Riverside Station. Reverse Flow principle could save Savannah hundreds of dollars: leaves, twigs, algae and other foreign matter can be flushed from tubes and tube sheets without shutting down the unit.

BECAUSE Reverse Flow design eliminates hours of costly down time

C.H. WHEELER CONDENSERS SAVE YOU MONEY

Let's suppose the condenser tubes and tube sheets in your station become clogged. If your condenser is of conventional design and serves a 200,000 kw turbine, you'd need many hours to clean the tubes, and each hour you spend could cost as much as $330!*

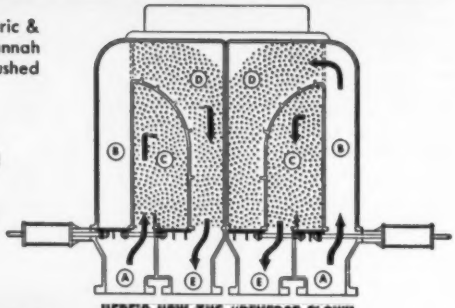
But with C.H. Wheeler's Reverse Flow design, you could flush away debris in a few minutes without shutting down the Condenser!

Reverse Flow is only one of the features of C.H. Wheeler Dual Bank Surface Condensers which save you money. Other money-saving features which result from Wheeler's 55 years experience in designing and building Condensers and auxiliaries, include better tube sheet design and advanced engineering of Tubejet® Steam Jet Ejectors, Condensate Pumps and Circulating Pumps.

*Based on an estimated cost of $8,000 per day for shutdown of a 200,000 kw Turbine-Generator.

C.H. WHEELER SAVES YOU MONEY IN THESE WAYS, TOO

- Pure condensate
- Lower absolute pressure, higher vacuum
- "Zero" condensate temperature depression
- Deaeration to 0.03 cc. of oxygen per liter. (Special design provides for deaeration to 0.01 cc. per liter.)



HERE'S HOW THE "REVERSE FLOW" PRINCIPLE WORKS

Left Side Shows Normal Operation: Water enters inlet A with right port open, flows through tube bank C to rear of condenser; then it returns through tube bank D to front of condenser and discharges at point marked E.

Right Side Shows Reverse Flow: Sluice gates move on a common stem. Water flows up through channel B, through tube bank D to rear of condenser; returns through bank C to front of condenser.

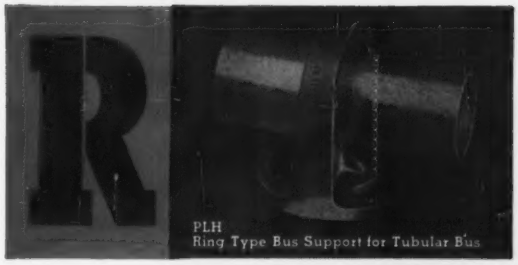
In the C.H. Wheeler Divided Water Box design each half of the condenser can be back-flushed independently of the other; or both halves can be back-flushed simultaneously, with one or two circulating pumps operating.

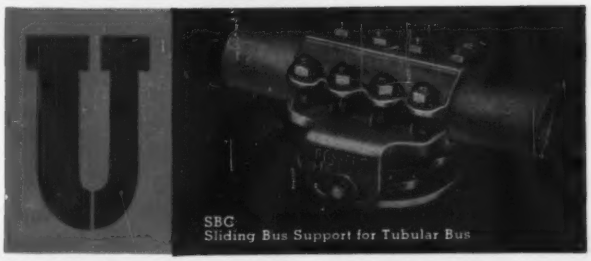
C. H. WHEELER MFG. CO.

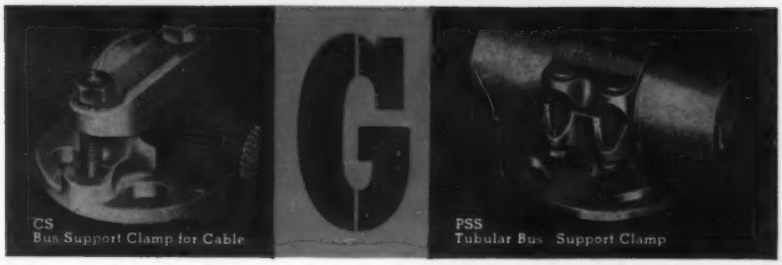
19th and Lehigh Avenue • Philadelphia 32, Pennsylvania

Whenever you see the name C.H. Wheeler on a product, you know it's a quality product.

Steam Condensers • Steam Jet Vacuum Equipment • Centrifugal, Axial and Mixed Flow Pumps • Marine Auxiliary Machinery • Nuclear Products







DOSSERT HIGH-STRENGTH BUS SUPPORTS

• Higher cantilever strength • Higher impact resistance
• Higher corrosion resistance • Greater durability

These Dossert Bus Supports are made of a high tensile strength cast bronze alloy and are equipped with silicon bronze bolts and nuts, making the entire unit completely non-magnetic. Available for all sizes and types of busses. Dossert Bus Supports can also be furnished in Coupling, Tee Connecting, Elbow Connecting, Tee Coupling and Expansion Connection types.

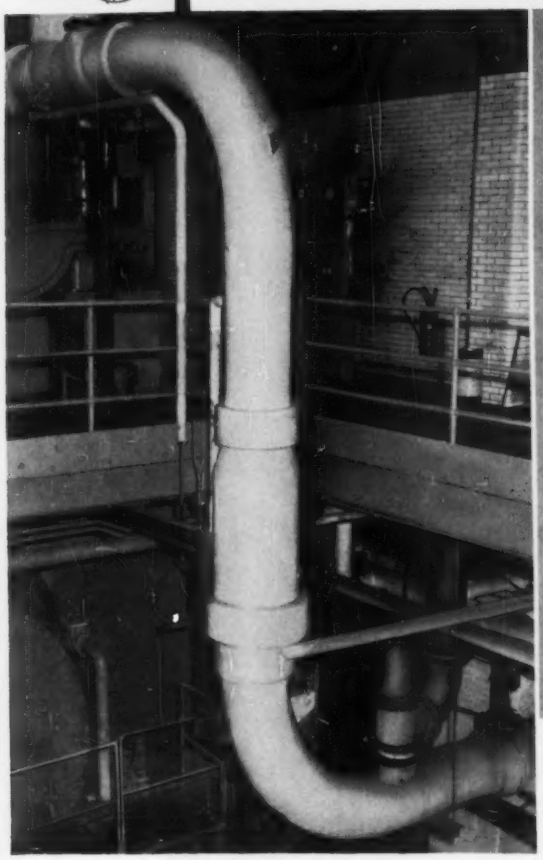
Special fittings and modifications can be readily supplied on short notice.

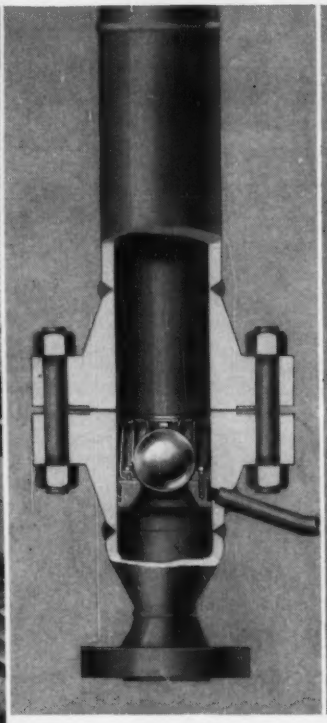
50 YEARS OF TECHNICAL ADVANCEMENT

DOSSERT MFG. CORP.

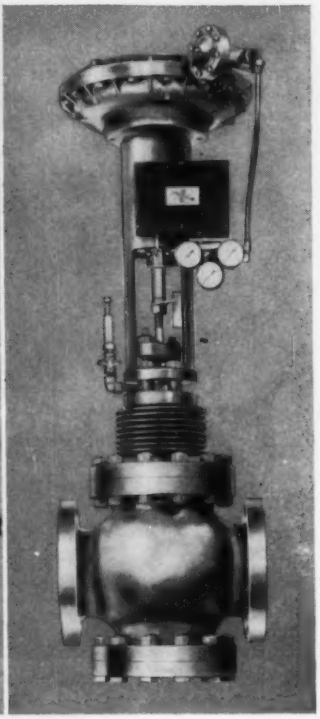
249 Huron Street, Brooklyn 22, N.Y. • Representatives in all principal cities
IN CANADA: W. S. Gerrie & Assoc., Ltd., Toronto

How Copes-Vulcan control systems boost power plant efficiency





Steel ball controls orifice opening. Incoming steam lifts the ball in an amount determined by the weight of the ball and the amount of steam flow. Pressure drop of about 3 psig is held constant at all rates of flow.



Copes-Vulcan valve . . . for regulating desuperheater cooling water. Noted for accuracy and dependability, Type CV-D diaphragm-operated valve is available in sizes to 12-inch. Write for Bulletin 1027.

New Copes-Vulcan Desuperheater handles the tough temperature control jobs

Using a unique design principle Copes-Vulcan's newly developed Variable-Orifice Desuperheater* provides superior temperature control demanded on the most critical job. Installed in a steam header supplying a 12,500-kw turbine-generator, this desuperheater holds temperatures within a plus-or-minus 3F limit—even though it is located just 20 feet upstream of the turbine throttle.

With only one outside connection and only one moving part, the Variable-Orifice Desuperheater simplifies maintenance. Skillful design eliminates the need for long runs of piping, atomizing steam, spray nozzle and glands.

The Variable-Orifice Desuperheater is one of several types—each engineered to meet particular operating requirements. Write for Bulletin 1037.

Single source . . . custom design . . . skilled service

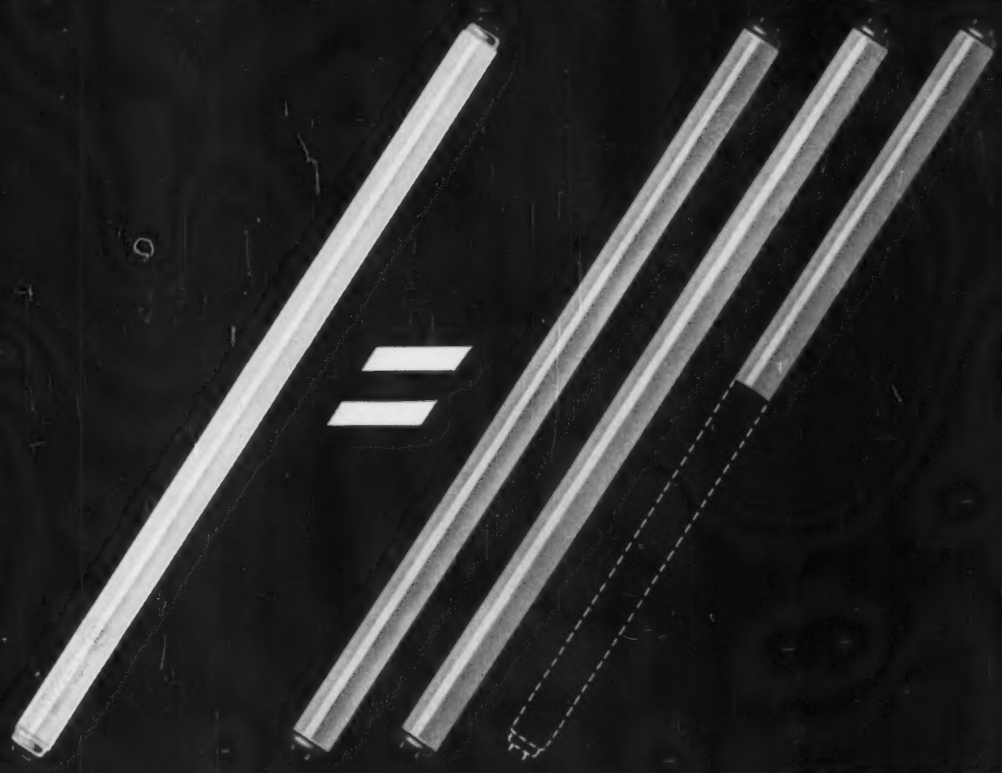
Desuperheaters are a part of Copes-Vulcan's complete line of control systems for superheat and reheat temperatures, feed water, combustion and pressure reducing operations.

Available in separate units or integrated into a single package, these control systems are custom-designed to meet individual specifications, and are serviced periodically by experienced Copes-Vulcan field engineers. For a survey of the line, write for Bulletin 1022-B.

*Patent applied for.

Copes-Vulcan Division
BLAW-KNOX COMPANY
Erie 4, Pennsylvania

With no change in tube shape or size, new Sylvania **VHO** delivers as much light as 2½ standard fluorescent tubes



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Long Island Lighting takes the long view —with "U. S." Conveyor Belts

In the near future, that wide expanse of meadow in the background is likely to be filled with industrial establishments or housing projects. For this is Nassau County, N. Y., one of the fastest-growing population centers in the country.

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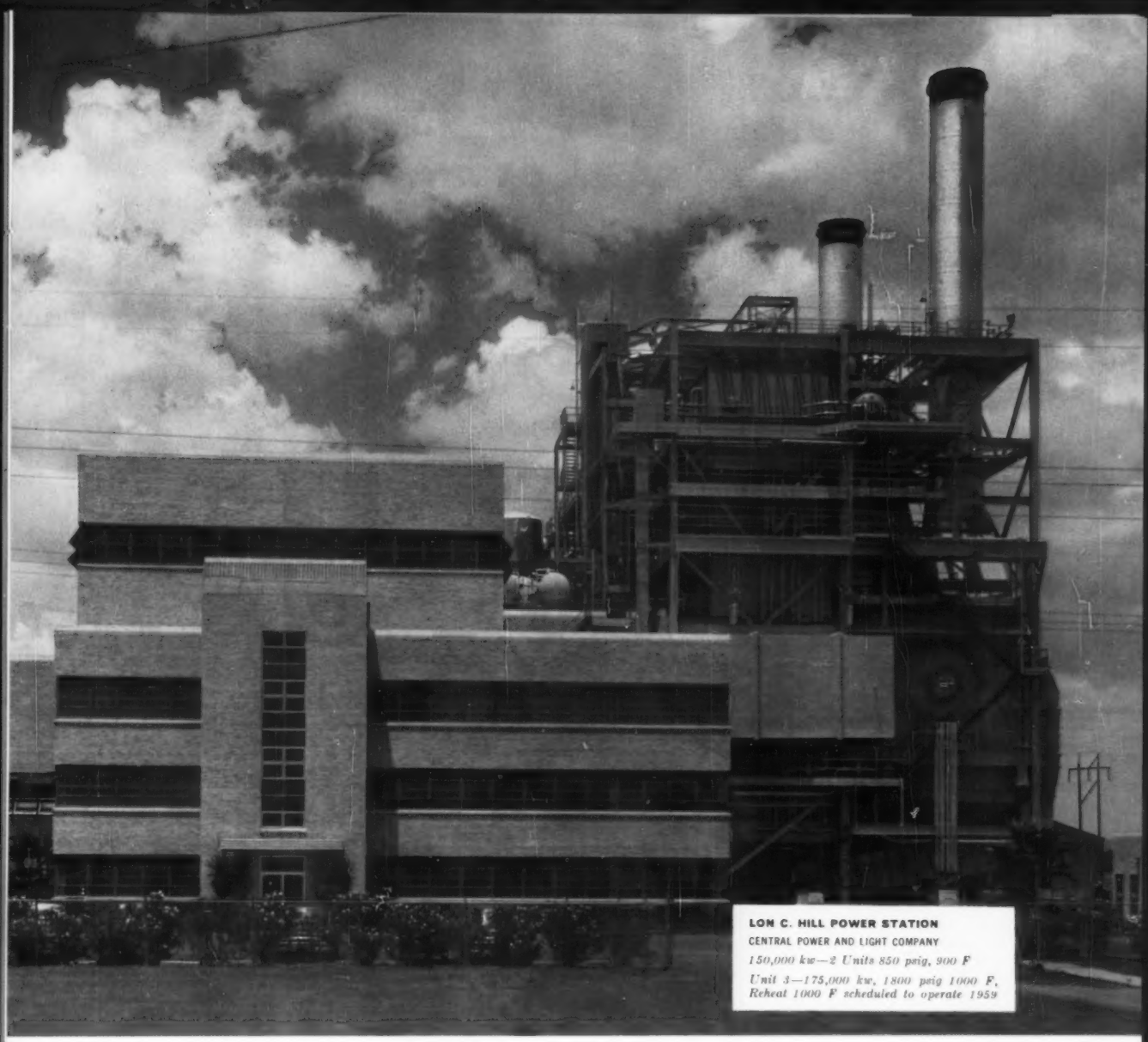

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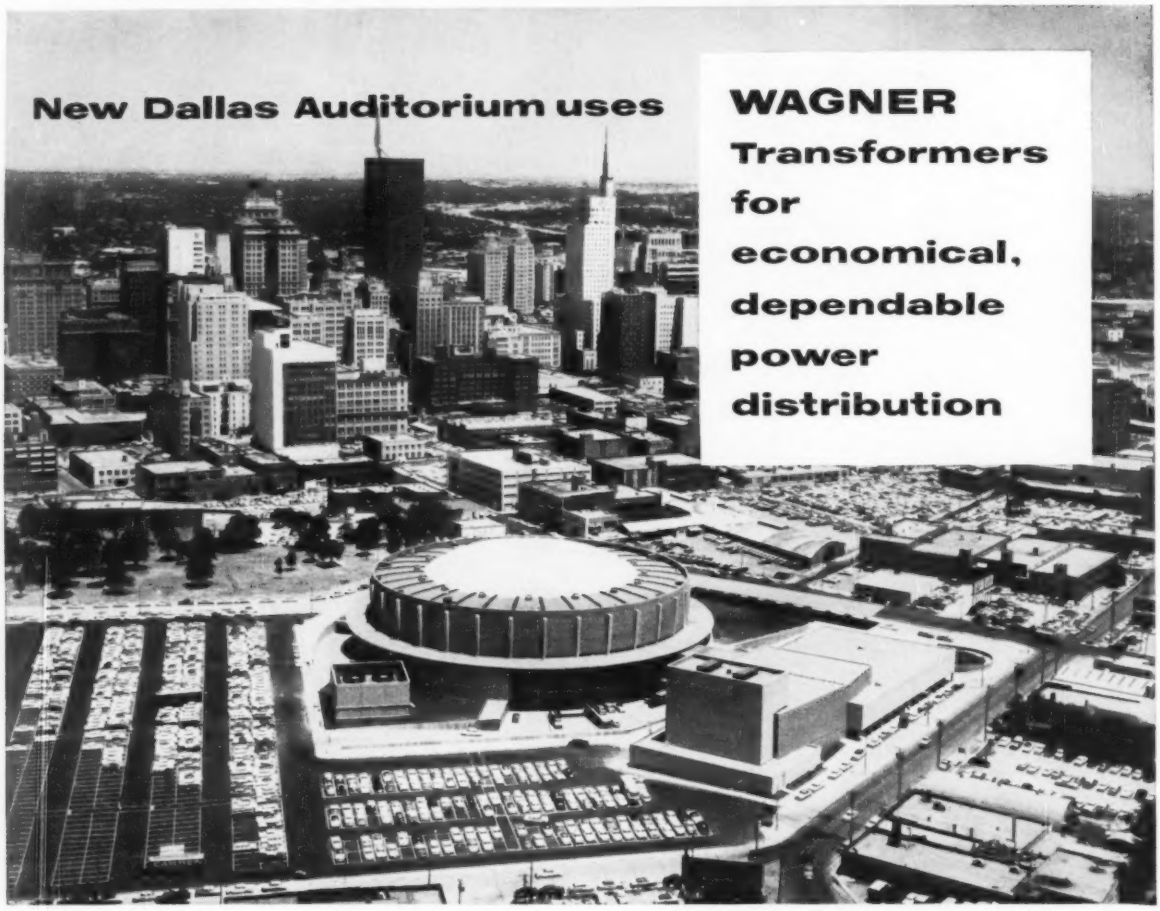

The mammoth, saucer shaped Dallas Memorial Auditorium, with its 300 foot diameter circular stadium, is a tremendous consumer of electric power. Its total connected load for power and lighting is 3250 kva. That's enough electricity to supply the power needs of 1200 modern homes!

This electric power is distributed efficiently and economically by 21 Wagner Dry Type Transformers. These transformers put the correct voltage right where it is needed—close to the load. Such installations are extremely economical because they eliminate long runs of wiring and reduce line losses in the distribution system. They meet all safety requirements for indoor installation.

Wagner Dry-Type Transformers can answer your power distribution needs just as they do at the Dallas Auditorium. Call your nearby Wagner Sales Engineer and have him tell you how these transformers can modernize your power distribution system. Bulletin TU-57 gives full information if you prefer to write.

A 300 kva Wagner Dry-Type Transformer in the Dallas Auditorium . . . one of 21 of these units, ranging from 25 through 300 kva, that provide a total capacity of some 2400 kva.

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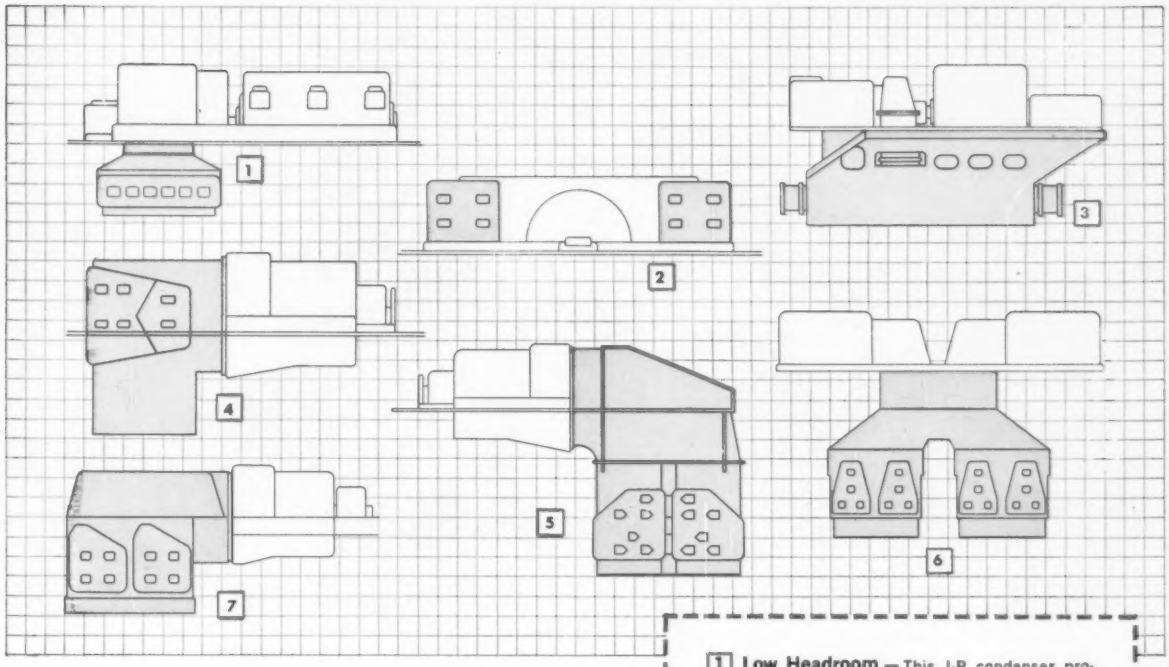
Look what Ingersoll-Rand is doing to surface condenser design

to help power companies produce more kilowatts in less space and with better efficiency



1 **Low Headroom** — This I-R condenser provides 65,000 sq ft of surface in an under turbine area that allowed only 14′ 8″ of headroom.

2 **No Headroom** — This twin shell 110,000 sq ft condenser is integrated into the advanced design dual side-exhaust turbine.

3 **Integral Foundation** — The I-R condenser here serves as the foundation for the bottom-exhaust turbine and generator.

4 **Axial Exhaust Turbine** is served by this I-R condenser located at the turbine floor and direct connected for straight through steam flow.

5 **Low Syphon Head** was one of the requirements for this I-R condenser connected to the axial-exhaust turbine by a precisely engineered transition elbow.

6 **Independent operation** of either shell and reduced headroom result from this twin shell arrangement of a 212,000 sq ft I-R condenser.

7 **Compact, space saving** arrangement of a 110,000 sq ft condenser connected to an axial-exhaust turbine with steam flow to the condenser tube bundles located offset and below the turbine exhaust centerline.

EACH of the surface condenser designs shown above didn't "just happen." To the contrary, each one was deliberately and painstakingly engineered by Ingersoll-Rand after careful study and analysis of the customer's requirements. And because the basic rectangular design of I-R condensers permits varying the ratios of length, width and height over wide limits, a great variety of space requirements can be effectively met . . . turbine-condenser arrangements can be "tailored" for each installation. Furthermore, this is accomplished without departing from the fundamental proven *high-performance* principles such as controlled longitudinal distribution of steam with controlled flow areas and velocities . . . principles which Ingersoll-Rand originated and developed to increase condenser efficiencies.

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Let an Ingersoll-Rand Engineer tell you more about the advantages and the engineering that has made I-R condensers first choice with so many power companies. Ask him for your copy of Form 9300, New Horizons in Condenser Progress.

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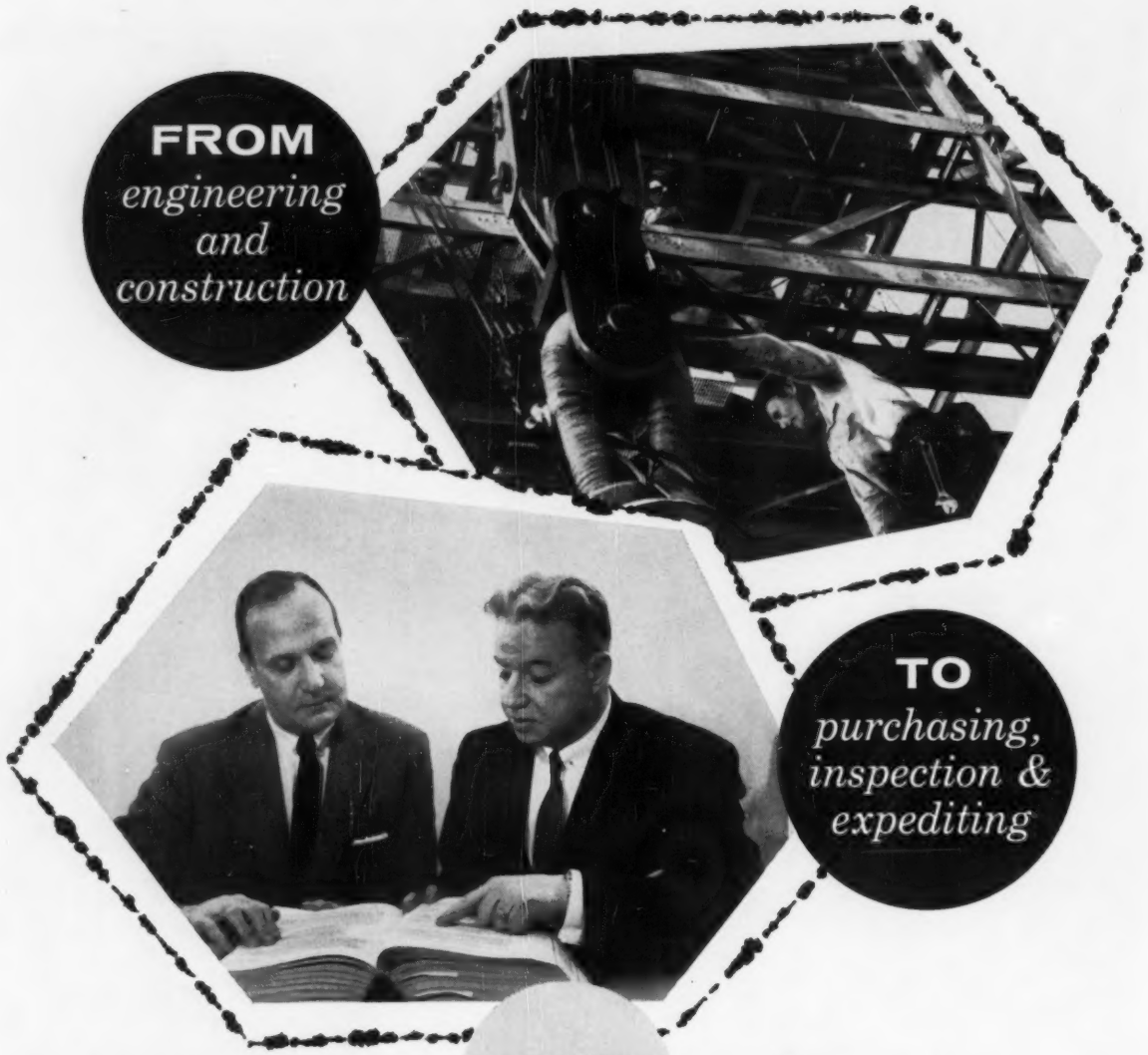

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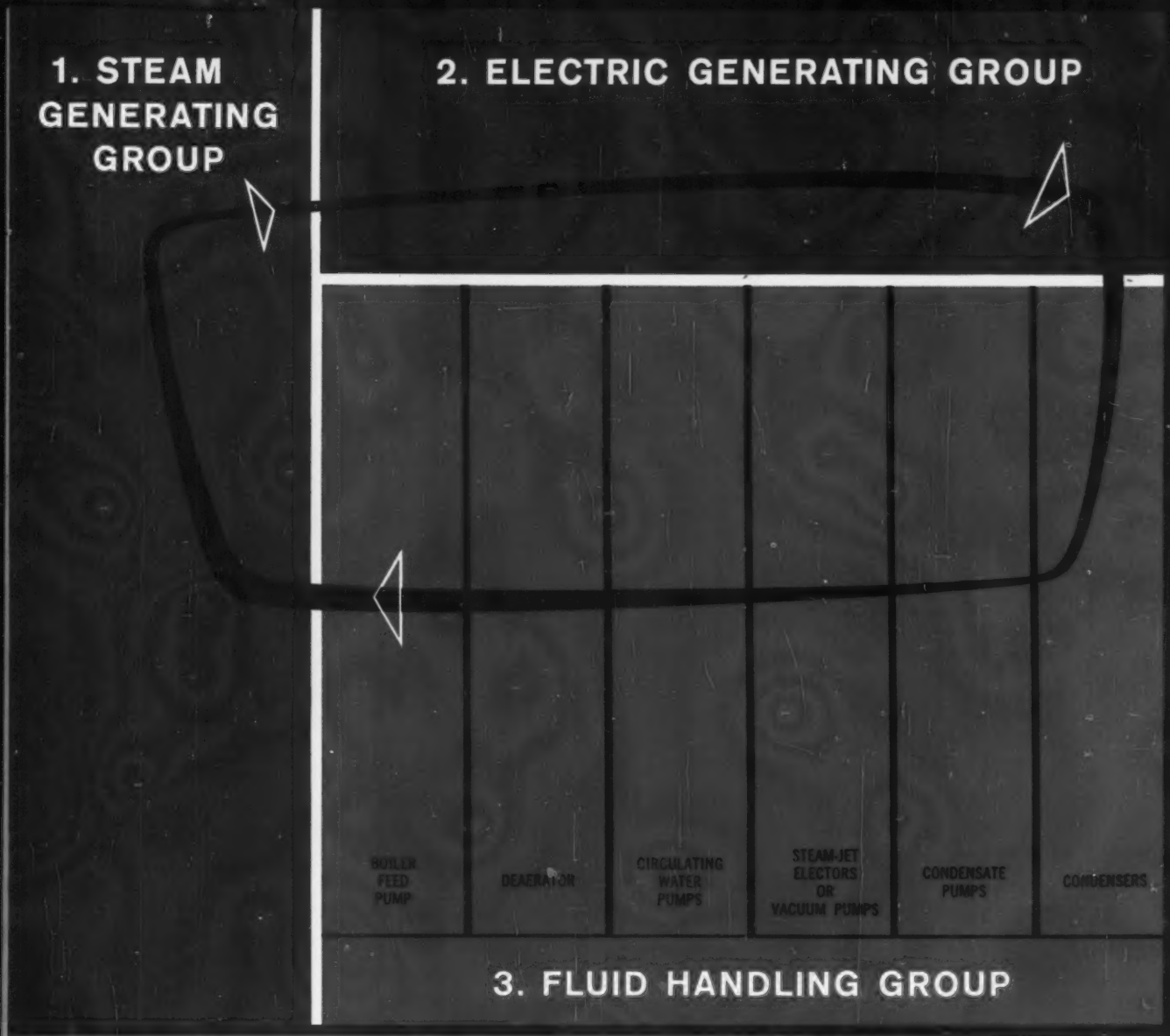

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June 23, 1958

The EEI Convention in Retrospect

The 26th Annual Convention of the Edison Electric Institute carried the title "Power Is Our Business." The program theme was aimed at the challenges, the opportunities and the obligations of the industry in the next two decades.

We were first told that total industry sales will reach 3 trillion kwhr by 1979, and that peak loads will reach 578 million kw. Such sales and peaks represent an annual growth of 8% per year or doubling every nine years. This is now the highest estimate for industry growth on record.

How is this growth proposed to be attained? First, the board of directors approved a sales program which will carry on activities similar to the "Live Better Electrically" program and will be backed initially with annual expenditures in the neighborhood of two million dollars. In addition, there is to be coordination of this activity with that of the manufacturers.

The members of the Institute were urged to review their sales expenditures and revise upward; increase their sales force and improve their caliber; secure the help of employees in the selling effort; and to compete more effectively with the gas business.

Assuming that the sales program is adequate to produce the loads which have been forecast, we were told that there is a money problem. The growth of the electrical system will increase the investment by $184 billion. A substantial part of the money will have to be raised in the open market. It was pointed out that users of capital funds are likely to prove numerous and demanding, with a reasonable chance that requirements will exceed supply.

The delegates were told that with this growth may come need for making substantial changes in organization structure and in assignment of responsibility for various functions; need for going toward more or less decentralization, better communications and increased codification of policies, procedures and standards; and need for engineering decisions based upon clear vision, readiness to change, and a long look ahead.

Utility management was told that there is too much "management intuition" . . . instead of recognizing that a public relations problem may be just as tough as an engineering problem. They were advised to use the expertness of the public relations man.

Much was said about public power, but in selecting a bit of advice for repetition we find this comment: The consumer must be made aware of the facts. Any educational program must be pitched altogether on the advantages that accrue to the consumer from the use of privately-owned utility service.

We hope these excerpts from the EEI convention program will give you a picture of the challenges, the opportunities and the obligations of the industry as pictured by the speakers. For further details, we recommend the full convention report which begins on page 85.

Politics and Recession: Possible

It's smart politics to oppose power company rate increases.

This city hall election year axiom, coupled with the staying power of the recession, threatens to trim down rate hikes granted to some utilities or at least will delay proceedings. Utility rates are just too attractive a target for politicians who feel obliged to keep their names in the news.

Illinois Power Co, for example, is under fire from the Illinois Utility Users Association. The group is headed by Mount Vernon Mayor Virgil T. Bailey. At the opening hearing on Illinois Power's request for a 6.68% rate increase, Mayor Bailey said in effect:

"If we had had an organization like (the Utility Users Association) 20 years ago, rates for electricity would be half of what they are now."

The company's attorney pointed out that under the present rate set up an average customer pays less per kwhr today than in 1938. Under the new schedule, average cost would be only slightly more than 20 years ago.

The new organization hopes to collect from 14 communities contributions of 10¢ per person. Business and industry has been asked to give 2% of yearly electric bills to fight the hike. Goal is $100,000.

A small consulting engineering firm was retained a week and a half ago for a June 24 hearing before the Illinois Commerce Commission.

"That doesn't give them much time to prepare for cross examination," observed a Illinois Power man. Because of the election year complication he doesn't expect the rate case to be settled until mid-November, which closes out the maximum time allotment set by the commission for handling the case.

Inflationary Facts of Life

Other companies are feeling the time-consuming impact of organized, vocal opposition. The rub is that most customers, while not welcoming any price boost, are willing to accept inflationary facts of life.

A Cleveland Plain Dealer staff writer doubts that there's "any real political juice" these days in fighting utility rate boosts. Philip W. Porter's column earlier this year pegged his view on "the superlative job of public relations and consumer relations" by companies such as Cleveland Electric Illuminating Co in the last 25 years.

Home users are too well conditioned by reliable service, quick repairs, and politeness to raise much of a storm over CEI's request for a 5% boost. Business concerns, though, would do "most of the squawking today," Porter said.

None the less, when CEI announced its rate aims in March, noisy opposition came from Cleveland Mayor Anthony Celebrezze and Law Director Ralph S. Locher. This was echoed spasmodically by political interests in the 91 municipalities of the greater Cleveland area.

CEI now feels that this opposition, which stressed the recession timing, has dwindled. For one thing, Locher has got himself crosswise by coming out in favor of a 19% hike sought by the city's water department and a 33% boost in transit fares while still objecting to CEI's increase.

It isn't fair to "compare a privately owned utility's bid for what

Rate picture for 1958 finds these companies . . .

Have received increases

	Sought	Got
Boston Edison	$ 2,488,000	$ 2,288,000
California Elec Pwr	2,008,543	2,032,000
Consolidated Edison	6,742,000	6,742,000
Empire District Elec	(9%)	600,000
Housatonic PS	714,000	580,000
Iowa-Illinois G&E—Iowa	(11 mills kwhr)	910,000
Kentucky Utilities	2,500,000*	2,778,000
New York State E&G	$4,200,000	$4,200,000[1]
Plymouth County Elec	251,500	251,500
Rochester G&E	2,500,000	2,500,000
Southern Nevada Pwr	1,060,000,	766,000
Tampa Electric	3,143,000	1,620,000
Wisconsin P&L		13,500
Worcester County Elec	1,300,000	1,300,000

and these boosts are in the works*

Baltimore G&E	$6,750,000	Consumers Pwr	$12,750,000	Niagara Mohawk Pwr	$10,452,000
Black Hills P&L	(5%)	Illinois Pwr	4,344,000	Otter Tail Pwr	350,000
Cincinnatti G&E	2,800,000	Iowa-Illinois G&E—Illinois	500,000	PS of New Hampshire	664,500
Cleveland Elec	5,500,000	Montana Power	3,800,000	San Diego G&E	6,750,000
Commonwealth Edison	25,200,000	Narragansett Elec	2,626,000	Upper Mich. P&L	103,000
Consolidated Edison	8,200,000	Newport Elec	183,000	Wisconsin Elec Pwr	5,900,000

[1]New rates in effect subject to further PSC action.

Snags for Utility Rate Hikes

might be excessive earnings with the water department, which asks only the right of survival," Locher maintains. But the company points out that its costs are up to a point where its record this year may be the poorest in history.

The city has hired a Washington utility expert, Martin T. Bennett, to study the CEI request. He will help present the city's rebuttal to the rate boost when hearings resume.

It has been noted that Mayor Celebrezze was in the midst of his campaign for nomination for governor when he came out with his original blasts at the increase and that he has been quieter since then. He undoubtedly will continue to oppose it, however.

Lee C. Howley, CEI vice president and general counsel, has presented the company's case before some 35 suburban councils and local groups, stressing the fact that construction costs have gone up 19% and coal prices, 12% since 1955. His office points out that when CEI made its formal presentation to Cleveland city council last fortnight only one suburban community was represented, indicating, for the moment at least, a waning interest in outlying districts.

Impact of Cheaper Money

There are some qualified exceptions to the political axiom. Local level elections in San Diego Gas & Electric Co's area are non-partisan and county officials have not made the company's rate request an issue. But a county rate expert says the recession means cost of money for financing company projects will be lower. The company counters that despite the slump all costs except fuel oil are inflated.

Impact of money costs was felt by Tampa Electric Co also. In cutting the utility's rate hike request in half, the Florida commission cited much lower interest rates as compared with the level prevailing when Tampa did its last financing. The commission ruled a 6.74% return was adequate and sanctioned a rate hike of 5.6% vs Tampa's proposed 10.9%.

Consumers Power Co reports no real opposition to its application, although about ten cities have adopted resolutions opposing any increase. A commission order is not expected until late in the year.

Relatively minor resistance met Commonwealth Edison Co's rate change bid. It came chiefly from five communities buying wholesale and distributing retail to their towns. City of Chicago filed an objection saying that on the basis of rate of return and evaluation, rates shouldn't be increased. Commission ruling was due June 20.

Industrial customers in Buffalo, N. Y., are once again vigorously opposing Niagara Mohawk Power Corp's request for a $10,452,000 system-wide increase. A group of 33 industries on two occasions in the past has organized an Industrial Power Consumers Conference to fight proposed hikes. The Buffalo concerns are big users of 25-cycle as well as 60-cycle power in an area where large blocks of hydro power had in earlier years permitted generally lower rates. The company's efforts to equalize rates has been branded "a breach of faith."

Industrial users, mostly textile companies, are arguing against the coal clause surcharge in effect for several years in Carolina Power & Light Co's schedule. The industries' petition hinges now on charges that the power company's 6¼% rate of return is excessive. Previously, the state commission ruled that the petitioners' failed to show that the coal clause was discriminatory.

Federal Atom Plan in the Mill

The evidence is in, as far as the Joint Committee on Atomic Energy is concerned. Now the Democratic-run body turns to convincing the full House and Senate that the times call for a $500 million federal reactor program in the next five to seven years.

Rep Chet Holifield (D-Calif.), chairman of the legislation subcommittee, hopes to have the 1959 authorization bill for the Atomic Energy Commission ready for submission to the House Rules Committee this week—and to the full House and Senate by July 4.

As EW went to press, Democrats on the joint committee were putting the final touches on an ambitious five-year program that goes considerably beyond AEC's own program.

Although final details were still uncertain, the Democratic program —to be reflected in the committee report accompanying the authorization bill—is expected to contain these elements:

- A goal of achieving economic nuclear power in the U. S. within ten years, and in friendly foreign countries within five. This is the same timetable laid out by the Eisenhower Administration.
- To attain this goal, construction of at least one-million kw(e) of new atomic power capacity in the next five to seven years. This does not include projects already programmed either by private industry or the government. But it does include any future projects announced by industry.

Construction costs are estimated at roughly $500-million. Government research and development outlays of $300-$400-million are recommended, along with at least $100-million basic research.

- Top priority should go to advanced types of light water reactors, a gas-cooled reactor, a heavy water model burning natural uranium, and a plutonium producer.

But the joint committee also wants accelerated development of other types—such as the two-region aqueous homogeneous and the sodium cooled, graphite-moderated reactors. Privately, the Democrats agree with AEC that it's impossible to lay out a timetable on initiating various reactor types more than a

years or perhaps two in advance.

• Although the power reactor demonstration program will be continued, with the deadline for starts extended to Dec. 31, 1959 as AEC requested, the joint committee will lay down these rules for the future:

1. Partnership, with few exceptions, should be limited to development and construction of the larger second and third generation of reactors of a particular type, with the first generation being handled by AEC.

2. AEC should decide what types and sizes of reactors are needed most to achieve competitive nuclear power, then allow private industry a chance to participate.

3. AEC must take a tougher attitude toward deadlines for industry participation in a particular project, so government construction can go forward if industry isn't interested.

In addition, the committee may try to generate a new push behind development of reactors for propulsion of merchant ships and for process heat.

Electric utility industry sources agree that it's easy to exaggerate the importance of the Democratic "program" in terms of actual federal reactors that will result. Most of the program won't even show in the authorization bill. It will go into the committee report as an expression of congressional intent. As a result, future congressional action will be required.

Industry spokesmen thus are worrying more about the projects that are likely to be found in the authorization bill for the next fiscal year when it hits the House and Senate floors within a week or two. These include: federal construction of a gas-cooled, graphite-moderated reactor; one or possibly two plutonium reactors; design work on two advanced type water reactors; and possible construction of a heavy water moderated and cooled reactor burning natural uranium.

Republican lawmakers are expected to insist on a clause that any big federal power reactors can be built only at AEC production installations with the power being used by AEC.

There's speculation that either the gas-cooled or heavy water reactor will be built at Oak Ridge.

Hoosier Co-op Alters Plan For Indiana Power Plant

Hoosier Cooperative Energy, Inc, no longer plans to sell power to a proposed aluminum plant in southern Indiana, Rural Electrification Administrator David Hamil told a House government operations subcommittee last week. He said he understands Hoosier "is working on another plan of operation," involving a smaller REA loan.

The Indiana group applied last year for a $42-million loan— largest in REA history—to build a 198,000-kw generating plant, including a large block of the power to be sold directly to Richards & Associates, a Georgia aluminum wire firm. REA sent the application back to Hoosier for revised data, and the co-op never re-submitted the application.

◂2 Utilities Rebound From Big Blows

Northern States Power Co of Minneapolis bounced back quickly from about $200,000 damage caused by a Wisconsin tornado June 4. Two 115-kv lines and one 69-kv line were knocked out when structures were blown over. Worst hit was the 115-kv tower line between NSP's Wisconsin plants and Minneapolis-St. Paul. Seven towers on this line crumpled, five of them near the Colfax, Wis., area seen here. All but hardest hit communities were on the line within 24 hours.

Six days later, Eldorado, Kans., was hit. A division point of Kansas Gas & Electric Co, Eldorado is served by four transmission lines—138 kv and 69 kv from Wichita, 161 kv from Omaha and 138 kv from Parsons, Kans. The Omaha line lost two H-frame structures and a number of poles. All four of the city's 12.5-kv feeders went out. Local service was restored within 11 hours, despite delays caused by spectators.

EEI Program . . .

. . . for electric living promotion will begin in 1959

A national "core" program to boost the home use of electricity will be undertaken next year, the Edison Electric Institute convention was told last fortnight in Boston. The plan received approval from EEI's directors at the session.

"The Institute will sponsor and administer a basic, or core, program" in spearheading the activity, said outgoing EEI president, J. W. McAfee. "Manufacturers and trade allies are expected to cooperate by integrating their national advertising over their own names" with the plan.

Institute members who wish to participate will finance the program on a voluntary basis, McAfee said. There will be no charge to non-participating members.

General aim of the plan is to increase residential use of electricity through sales of more appliances, home lighting, wiring capacity, and consumer education.

Members of the program committee are M. I. Allen, Philadelphia Electric Co; T. G. Ayers, Commonwealth Edison Co; P. D. Brooks, American Electric Power Service Corp; J. R. Furber, Northern States Power Co; C. D. Lawrence, New England Power Service Co; J. H. Mead, Southern California Edison Co; George W. Ousler, Duquesne Light Co; W. M. Shepherd, Arkansas Power & Light Co; C. M. Wallace, Jr, Georgia Power Co; Don Willis, Arizona Public Service Co.

Annual Report Awards Conferred

Consumers Power Co was awarded top honors in the Reddy Kilowatt contest for the best 1957 annual report. A plaque was presented to Consumers' Senior Vice President James H. Campbell by Ashton Collins, Sr, head of Reddy Kilowatt, Inc, at EEI's convention. Other winners:

Seated, left to right, Henry B. Sargent, president, American & Foreign Power Co; Gordon W. Evans, president, Kansas Gas & Electric Co; Donald F. Kennedy, president, Oklahoma Gas & Electric Co; Campbell; Fred J. Herr, Jr, assistant to president, Central & Southwest Corp; Ralph Trower, treasurer, Orange & Rockland Utilities, Inc; and Milton L. Kapp, president, Interstate Power Co.

Standing, Kimball Jack, vice president, Washington Water Power Co; Col J. C. McKeen, president, Nova Scotia Light & Power Co; George Fewkes, personnel manager, Philadelphia Electric Co; J. F. Purcell, public relations manager, Northern Indiana Public Service Co; W. M. Shepherd, vice president, Arkansas Power & Light Co; Paul V. Hayden, vice president, Connecticut Light & Power Co; G. W. Van Der Zee, chairman, Wisconsin Electric Power Co; M. C. Heffelman, vice president, Public Service Co of New Mexico; Charles Caldwell, vice president, Orange & Rockland Utilities, Inc; Paul O. Canaday, vice president, Middle South Utilities, Inc, and Douglas Anderson, manager, Nova Scotia L&P.

Benson's Role Still Cloudy on REA Loan Authority

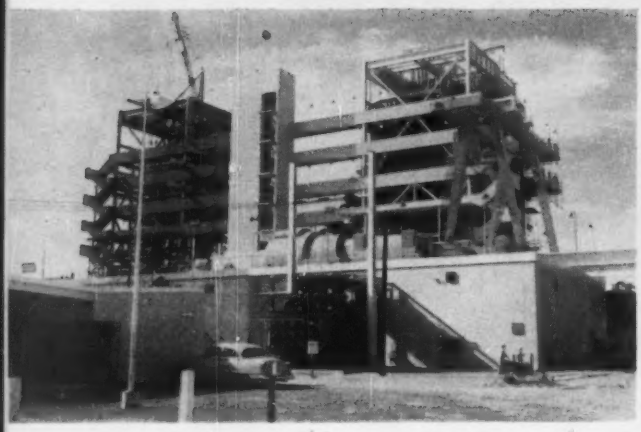
The first round of hearings on proposed legislation to free the Rural Electrification Administration's loan-making authority from "final" review by the Secretary of Agriculture has ended—and nobody seems quite sure of how much power the Secretary actually possesses.

Identical bills, introduced by Sen Hubert Humphrey (D-Minn.) and Rep Melvin Price (D-Ill.) are intended to give back to REA's administrator "all functions which were transferred to the Secretary of Agriculture" by that department's 1953 reorganization plan. However, these bills have little chance of passing Congress this session. Clarifying changes in them appear necessary if the bills are to be re-introduced in the next session.

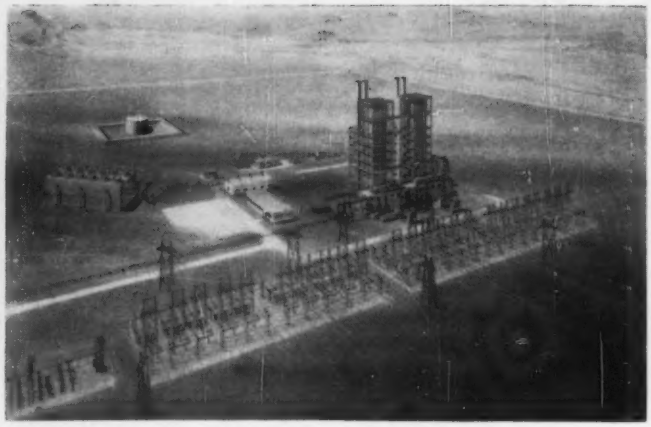
Clyde T. Ellis, general manager of the National Rural Electric Cooperative Association, is pushing for the bills. He claims the 1953 reorganization plan gave Agriculture Secretary Benson added power, which he used in July, 1957, to limit REA Administrator David Hamil's loan-making authority. The change required Hamil to clear all loan applications over $500,000 with Kenneth L. Scott, director of agricultural credit services.

Ellis and Humphrey claim this was in direct conflict with the REA Act of 1936, which vested full authority in the REA administrator.

Benson maintains he has not interferred with Hamil's loan-making powers in any way, and that he only suggested Hamil discuss large loans with Scott before approval. Anyway, Benson points out, the Secretary of Agriculture has had tacit authority to make or deny REA loans ever since the REA was placed in that department in 1939. The 1953 plan clarifies that authority, he said.



SALT RIVER DISTRICT'S Agua Fria: 200 Mw



ARIZONA PS CO's Ocotillo: 220 Mw

New Agreements Pay Off in Arizona

Replacing many long-standing contracts with two, Arizona Public Service Co and Salt River Power District agree on:

- **Specific service area boundaries and**
- **Joint system planning, construction, and operation**

The two steam plants shown above symbolize joint system planning and operations between Arizona Public Service Co and Salt River Power District in their contiguous central Arizona service area.

The two utilities have consolidated many long-standing contracts between them into just two: a Territorial Agreement and a Power Coordination Agreement.

Joint planning of generation is only one feature of the cooperation between the two utilities. The Coordination Agreement provides for cooperative electric system development and operation, power sale, and interchange. The Territorial Agreement defines service area boundaries within the "contiguous" area.

The new Agreements are the latest in a long series of contracts between the two utilities dating back as far as 1901. Then Phoenix Light & Fuel Co (today merged into Arizona PS Co) entered into a written contract with Arizona Water Co (an ancestor of the Salt River Project) under which the Light & Fuel Co was granted exclusive right to develop water power on the canal system owned by the Water Co. Result was a 400-kw hydro plant on the Cross-Cut Canal in 1902.

Eight other contracts between successors of these pioneer organization followed in the next 37 years. As successor organizations honored the previous contracts, each new agreement did not supersede, but supplemented all those previously in effect.

Noteworthy is a 1922 contract between the Central Arizona Light & Power Co and the Salt River Valley Water Users' Association. It included a statement of fundamental condition which has continued ever since to serve as the driving force for the cooperative relationship between the two utilities:

". . . the Company and the Association have each constructed transmission and distribution systems in the Salt River Valley and vicinity in territory largely contiguous and it is desirable that a wasteful duplication of such investment and direct competition between the two systems be avoided, in the best interest of the public as recognized by the Courts, the Public Service Commissions and other public authority . . ."

Following World War II, load growth in the "contiguous" area was spectacular. Maricopa County, with Phoenix at its center, now has over half of Arizona's more than one million citizens.

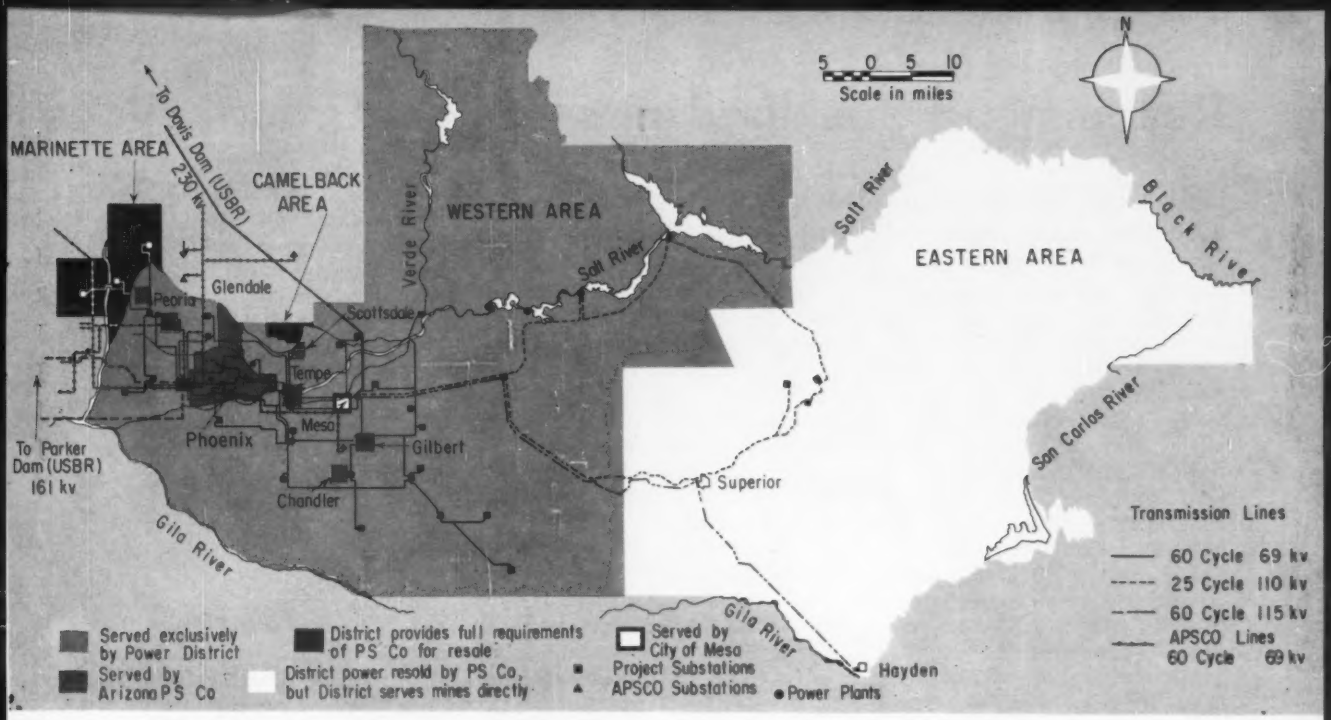
New Capacity Needed

As load grew, both Arizona Public Service Co and Salt River Power District were compelled to build more steam-electric generating capacity. The District expanded Cross-Cut in 1949 to 33 Mw. The Company enlarged Phoenix to 155 Mw by 1950. The District followed with Kyrene, adding 33 Mw in 1952 and 66 Mw in 1954. Public Service's Saguaro went on line in 1954.

By then, both organizations were planning still more steam capacity. Each needed a plant east of Phoenix and another in the northwest area of the Metropolitan District.

Seeing a chance for economy, they agreed mutually to study their respective systems with the objective of working out a single system design and method of operation.

What they found was a hodge-



podge of overlapping contracts. Most dealt with territorial agreements and the sale and purchase of power. Interpretations were difficult because of time-obscured terminology. Most of the contracts were by predecessors of the two utilities, and covered situations that no longer existed. Territorial agreements were complicated by expansion of corporate limits of incorporated cities.

In this atmosphere, negotiation teams from each organization began discussions in 1954, bent on modernizing and clarifying prevailing pacts and resolving differences without long and costly litigation.

Ultimate result was the two important contracts which now guide joint operations: The Territorial Agreement of August 31, 1955, and the Power Coordination Agreement of September 15, 1955.

The Territorial Agreement (EW, Nov 15, 1954, p 105; Oct. 3, 1955, p 196) sets service area boundaries as shown by the map, Boundaries are permanent, unaffected by future changes in municipal limits: If Phoenix, served by Public Service Co, expands its city limits, the acquired territory will remain with Salt River District.

In the Eastern, Marinette, and Camelback Areas, the company serves customers, but buys "Territory Equivalent Power" from the District to do so. An exception: In the Eastern Area, the District serves mining, milling, smelting, and related customers directly.

Areas not shown on the map are served by Arizona Public Service Co, as part of its statewide system.

The Power Coordination Agreement provides for cooperation in development and operation of the two electric systems, and for sale and interchange of power between them. Major features are:

• **Planning** of new facilities. Authorized representatives consult regularly, and cooperate in planning their systems to mutual advantage.

• **Additions** to system facilities: The District agreed to complete by June 1 the two-unit, 200-Mw Agua Fria steam plant. The Company has agreed to build the two-unit, 220-Mw Ocotillo steam plant by 1960.

• **Power sale** by District to Company. Method is specified for determining contract demand, delivery points, and demand and energy rates for three types of power:

1. Territory Equivalent Power is sold to the Company in an amount equal to its requirements in the Eastern, Marinette, and Camelback Areas.

2. Contingent Power is sold on prescribed schedules, but with delivery contingent upon availability of certain District units.

3. Firm contract power is sold in small amounts.

• **Economy energy interchange.** Either system must use energy available from the other if its basic cost is less than cost of energy from another source. Savings realized are divided equally. Neither is obligated to furnish such energy if this would impair its own service, or if a more profitable market exists. Economy interchange energy is scheduled day to day, and the parties will agree from time to time on the basic cost of energy from any source.

• **Spinning reserve interchange.** Amount and location of spinning reserve is determined jointly, each party being responsible for its share. If one is deficient, based on quota, it must reimburse the other for the kw deficiency.

• **Capacity equalization.** The two systems share the cost of supplying temporary one-sided and unusual capacity excesses. The area's load and load growth, if served by a single system, would justify larger generating units than either system could justify alone—with resulting lower cost per kw and improved effi-

(*Continued on page* 176)

Recommend Peaking Units To PEA Group

Stormproof T&D designs are Skytop PEA topic, and Greensburg meeting hears about use of split channels for radio

The gas turbine and a new transportable 6-Mw Diesel electric plant were recommended for system peaking at the recent meeting of the Pennsylvania Electric Association's System Planning Committee in Garden City, N. Y. General Electric Co and Westinghouse Electric Corp engineers recommended the first; General Motors Corp engineers the latter.

W. D. Marsh, GE, said that his arguments for use of gas turbines did not revolve around the replacement of depreciated steam capacity, but rather on the use of gas turbines instead of new steam units. Marsh and his co-author, R. P. Hayward, contended that the economic conditions governing the use of peaking generation have changed radically in favor of installing new capacity for this purpose.

Heat Rates Reviewed

Marsh and Hayward reviewed the heat rates of units in the 30 years between 1925 and 1955. In 1925 a system which always installed the best units available each year would have as its best a unit with a net station heat rate of about 15,000 Btu per kwhr, its oldest unit having upwards of 40,000 Btu per kwhr heat rate, they said. This system, they noted, could not afford a peaking unit of low efficiency when it had an opportunity of buying a unit with a heat rate 10,000 Btu per kwhr better than the system average of about 25,000 Btu per kwhr.

But in 1955 conditions had altered so that a new unit may now enjoy a difference of only 1,000 Btu per kwhr in heat rate. Hayward and Marsh said that a small amount of peaking capacity may be justified, often with a $20 or $30 per kw reduction in investment. And as the heat rate curve flattens out after 1955, and systems continue to grow, peaking generation will become more and more economical. The GE authors offered gas turbines as the logical prime mover for peak load generation.

Low investment, low operating and labor costs, quick starting ability, and adaptability to remote control were offered by K. C. Wein, Westinghouse, in a concurring recommendation of the gas turbine for peak load generation.

PEA members were given the merits of a new 6-Mw transportable Diesel-powered unit by engineers of Electro-Motive Div, GM. Designed specifically for peaking and reserve requirements the plant can be installed for $100 per kw, according to R. B. Johnstone. This cost includes $85 per kw for the equipment and an estimated $15 per kw for installation.

The new peaking plant consists of three 2-Mw generating units, each in its own steel, weatherproofed, sound-deadened housing, and one control unit with similar all-weather housing. Each generating and control unit is so complete in equipment that it is only necessary for the installer to provide a stone and railroad-tie, or concrete base, couple the cabling, and provide a fuel tank. The entire plant with transformer occupies a lot no larger than that for a small house.

Applications Cited

Johnstone cited these advantages:

1. Reliability, backed by GM's experience with Diesel locomotive power plants.

2. Simplicity of operation. Unattended operation is possible. Plant can be brought on-the-line with all three generators fully loaded and synchronized within 90 sec.

3. Good efficiency (about 11,000 Btu per kwhr).

4. Transportability by truck or railroad.

5. Low cost, ($100 per kw installed).

6. Acceptable noise level. It's about the same as the sound of traffic on a main highway.

The GM engineers stressed the elimination of transmission line losses by placing peak load generation at the load center. Johnstone gave two examples of possible peak loading and reserve situations. The first condition considered 1,000 hr of operation annually with standby reserve duty of 6,900 hr; the second 7,900 hr of standby reserve only.

For the first case the peaking power and reserve could be supplied the new Diesel equipment for $31 per kw a year. Using average utility values, Johnstone claimed that steam equipment for similar duty would cost $48 per kw per year. The costs in the second example were $18 per kw per year for the Diesel arrangement and $45 per kw per year for steam.

Johnstone said that 20-year life assumed for the Diesel equipment was conservative, particularly as GM can make quick replacement of any major component.

Discuss Storm Damage

What one Eastern company learned from initial analysis of structure damage and failure during the snow storm in March (EW, March 31, pg 32) was told to the Electrical Equipment Committee of PEA at Skytop, Pa., May 8-9. Ralph Neidig, vice president and chief engineer, Metropolitan Edison Co, said some design standards must be changed to apply a greater safety factor, particularly for overhead static wires, on transmission lines. Because there were "hundreds" of wood pole failures, design in this area will get a close look. A different guying design is indicated, said Neidig, and another look will be taken at wood pole substation structures. Also under consideration is a "weak link" in the first span of lines getting away from these types of structures. Neidig remarked that some of the emergency organizational procedures must be refined to cope better with natural disasters.

A new line of high-voltage, air-blast circuit breakers (EW, May 26, pg 71), using a basic design module to go from 10,000 Mva at 115 kv to 33,000 Mva at 460 kv, was described by R. B. Shores, GE.

Sleeve bearings have rendered outstanding service over many years on the Duquesne Light Co system, said G. W. Moore and H. A. Thompson, while experience with

(*Continued on page* 205)

26th ANNUAL

CONVENTION

Pres Jack Corette, Montana Power Co

Power Is Our Business

FEDERAL ENCROACHMENT ▶ **But to stay in business** electric utility companies must present their position in the American free economy. This was the most prominent theme of the 26th annual convention of the Edison Electric Institute as voiced by:

J. W. McAfee	(p 88)	Sen. Styles Bridges	(p 92)
Elmer Lindseth	(p 90)	C. E. Oakes	(p 98)
A. S. Boyd	(p 92)	Admiral Ben Moreell	(p 100)

FINANCE ▶ **It might be possible to work toward** providing a little more than normal added capacity when capital supply seems likely to be easier and slow down when reverse is true.— L. D. Brace, (p 90).

FORECASTS ▶ **The most important single obstacle** to the industry's residential load objectives is the aggressive competition of the gas industry. These goals can be achieved only by selling the concept of all-electric living.—R. J. Cordiner (p 88).

HEALTH ▶ **Rest is the handmaiden of medicine.** It should be planned as a part of every day, week, month, and year of active life.—Sara M. Jordan, M.D. (p 94).

MANAGEMENT ▶ **Probably no single thing is so important** in assuring this kind of leadership as the right kind of top organization structure . . . free of drones.—S. L. Drumm (p 96).

PUBLIC RELATIONS ▶ **Plain, strong talk and private understanding** will solve public relations problems, say: A. G. DeLorenzo (p 95), S. R. Knapp (p 96), R. R. Gros (p 98).

SELLING ▶ **Let's prepare an ambitious, far-sighted, long-range program** of selective selling, designed to load our systems economically.—C. A. Tatum, Jr. (p 94).

"We'll need every bit of cooperation . . ."

"We must . . . enlarge our research programs . . ."

EEI Pres Corette Tells About

The man who takes over the reins at Edison Electric Institute this month is hard-riding, straight-shooting J. (Jack) E. Corette, president of Montana Power Co. He has a habit of starting off fast and keeping up the pace.

He became president of Montana Power at 44, which is a tender age for utility presidents. His hobbies are horseback riding, tennis, and hunting. For a "country boy," as he sometimes refers to himself, he has a cosmopolitan air that puts him in good stead whether talking with Wall Street financiers or Montana ranchers.

He is one of those rare personalities who commands respect while dispensing with the formalities. This respect is indicated by a number of groups—the Montana Power directors who chose him to head their company, the businessmen and bankers who recommended him for appointment as a director of the 9th District Federal Reserve Bank, the government which designated him to represent it in the United Nations' international electrical conferences, and most recently by the utility industry which chose him to head the number one trade organization.

In personal dealings, Jack fits the role of the typical westerner. His skin has the healthy glow of the outdoor man and he walks with a known destination. When he talks to you he looks you straight in the eye. And when you ask a direct question—you get a direct answer.

Photos along the top of the page and the interview that follows tell you something of the EEI president and the views he carries into his important new duties.

QUESTION: One of the big items of news coming out of the convention is approval of the national sales promotion program which EEI will spearhead. Can you give us some idea of the size of this program?

ANSWER: That will depend, of course, on the number of companies that will want to come in. Remember this is a voluntary activity. We're sure that we'll get wide support and we're sure things will be rolling by early next year. But it will take a little time to figure just how big it will be.

Q: Will manufacturers be invited to make financial contributions?

A: We don't contemplate any financial contributions from manufacturers, but we'll certainly need every bit of cooperation we can get from every segment of the industry. That includes not only our good friends, the manufacturers, but dealers, contractors, and distributors.

Q: Is this to be set up along the lines of the Live Better . . . Electrically program?

A: The main difference will be that the electric utilities will now assume national leadership in promoting all-electric living. I firmly believe that we have unanimous consent to continue using the slogan, "Live Better . . . Electrically," and I think it would be a mistake to drop this slogan which has become so well known to the public. We are greatly indebted to those who conceived and carried out the LBE program.

Q: Jack, would you sum up for us the two or three things which you believe will be the most important EEI activities in the year ahead? We've already talked about the sales promotion program. . . .

A: Yes, the Live Better . . . Electrically program will become increasingly important because we must depend on this effort to push the growth of our whole industry.

Secondly, I think we must talk more to people and groups outside our industry in an effort to make them more aware that the problems which affect our industry will ultimately affect all industry. I'm talking here mainly about stemming the trend toward socialism. I think we've had some encouraging signs lately, but there are still some very

"House heating should be promoted . . ."

"We have an excellent (EEI) staff"

New National Sales Promotion Plan

serious situations facing the industry.

And third, I think we must continue and enlarge our research programs if we are to keep our own costs in line and meet the demands of our customers.

Q: Just this week, your predecessor, Wes McAfee, predicted that the utilities will be selling three trillion kwhr a year by 1979. We certainly can't expect to reach that goal without hard selling and particularly unless we go all-out for electric house heating.

A: You may be right on that. Air conditioning in summer and house heating in winter give a well balanced load. I think electric house heating should be promoted wherever it is practical to do so. We must certainly recognize EEI as an electrical organization and its purpose is to promote electrical living.

Q: You talk about more contacts with groups outside our industry. Do you contemplate some program beyond our present PIP and ECAP programs?

A: I'm talking about more personal contacts. I'm talking about letting our wives and friends know something about our business—the issues involved in protecting our competitive system. Remember that our wives talk with many more people outside our industry than we do. And we need to get our free enterprise story over to business and labor organizations. After all, labor has as big or bigger stake in this system than we do. I know that because I've observed European workers and find that they often get only 30¢ to 80¢ an hour for their work, but the costs of goods in many of these countries are relatively the same as the costs here in the United States, with the result that the European workers cannot afford the things American workers accept as commonplace.

Q: Your third point is continuing research. We hear a lot about the need for research, but it is pretty hard to pin down any single activity being carried on by EEI.

A: I'll tell you one. The research committee at our board meeting this week obtained approval for a project to study means of retarding plant and tree growth. You have an idea of what that could mean in reducing tree trimming costs. Well the contract will be awarded to Battelle Institute, and we are hopeful that the research to be conducted will bring developments that will help us cut operation costs by millons of dollars. Of course, we can't be sure what will come out of this research. But we are hopeful.

Q: Do you think that less attention is being given to political problems and political subjects at this convention than at some of the previous conventions?

A: No, I don't think so at all. Just take a look at the speeches and you'll find plenty of discussion of political subjects. And I think that is as it should be. After all, our political problems are increasing rather than decreasing.

Take the TVA revenue financing bill. If that gets through, then we can expect also to see attempts to set up a Columbia Valley Authority, and other valley authorities throughout the country. You may recall that in the early 1940's there was a bill introduced to blanket the nation with nine authorities.

But there are some encouraging signs, too. For instance, some of the Public Utility Districts out in my area are beginning to finance their own projects rather than waiting for the federal government to put up the money.

Q: The EEI staff has certainly given us a well-organized, smooth-running convention.

A: Yes, and I think we have an excellent staff. It is extremely well organized and is comparable to the personnel and organization of a progressive company.

America's Power Industry

"Enough people unsympathetic to us, with an awareness of the value of public opinion, are doing their utmost to prevent us from offering facts about ourselves and the nation's power supply to the public."

J. W. McAFEE, President, Edison Electric Institute and Union Electric Co

There are millions in the world today who live in such circumstances of misery and ignorance that they cannot begin to imagine what the American standard of living really is, or how the free exercise of human ability could achieve it. To them the Russian system is more comprehensible because they have always been dominated by one form of government or another, and the standard of living promised by the Russians seems both desirable and attainable.

We have then a world-wide problem in misunderstanding which cannot be solved by the simple display of the dazzling fruits of our economic system.

And the problem is of great dimensions right here in the United States. How can we explain to the world how free men, in an atmosphere stimulating to their initiative and creative abilities, can produce more of all that is valued by mankind than any system run by government? How can we explain this to others when so many Americans don't understand it.

Whether we like it or not, man is an economic animal. What he does, by and large, is reflected in economic terms. In Russia, where government operates the economy, it also operates the chief tool of production, man. And a man cannot be free under those conditions, even in his thinking. In the United States, men and women are free to determine what they shall do, and the government is instituted by them to maintain order and fair play. When you have freedom of action, freedom of thought, of imagination, go with it—if for no other reason than because you have to pick among many courses of action to which to devote your time and energy.

When government operates the economy, it is operating the people and depriving them of freedom.

Sustained Effort Is Needed

"The most important single obstacle to the industry's residential load objectives is the aggressive competition of the gas industry. These goals can be achieved only by selling the concept of all-electric living."

RALPH J. CORDINER, Board Chairman, General Electric Co

The United States will need 665 million kw of electric generating capacity by 1979, in contrast with this year's 135 million kw, and it will take on the order of 3 trillion kw of energy to power a nation whose population will have passed the quarter-billion mark.

All the arithmetic that went into these computations may be correct, but that doesn't necessarily mean that they represent the shape of things to come. They are only goals; they can only be won by sustained effort, pursued courageously through good times and bad. And the most important decisions of today's executives are those that will not be proved until late in the 1960's and 1970's. The shape of things to come is being determined now—in the executive offices, laboratories, marketplaces, legislative halls, and the minds and hearts of men.

Research and engineering activities of the electrical industry are a major factor in the nation's growth prospects. Progress in atomic fission, for example, has been pressed forward by substantial expenditures from both private and government sources. The technical feasibility of power from atomic fission was proved by Dr. Fermi and his associates in 1942, but the important objective of economically feasible atomic power has not yet been reached. Yet the results, based on five pioneer reactors now operating are encouraging.

With this perspective, what is the probable timetable for fusion power? It has yet to be proved that fusion power is technically feasible. Fission and fusion are undoubtedly the two principal long-term prospects for basic change in utility technology. But it would be interesting to explore the challenges pre-

Flourishes in Ambient Freedom

Government operation of any industry, or any part of any industry, including electric power, inevitably starts the constriction and strangulation of human freedom, even though this may not have been intended in the beginning.

The only course which should be taken by the power industry is that which embodies the American philosophy of freedom and offers equitable tax treatment to all customers. We lead the world in electricity supply because electric service was developed by enterprising organizations in an atmosphere of freedom.

The question of so-called private vs government power should not exist. The fact that it continues to be an issue indicates that far too many people are not aware of the facts or that they do not understand them. And a climate of good public understanding is essential to us in the electric industry, if we are to realize the full measure of what we see in the future for our customers, our investors, our employees—for all Americans.

There are enough people unsympathetic to us, with an awareness of the value of public opinion, who are doing their utmost to prevent us from offering facts about ourselves and the nation's electric power supply to the public. There is no reason why we should aid them by not even attempting to tell our story. We are at the forefront of a struggle to defend two basic tenets of the American way of life —free speech, untaxed, not subject to censorship by governmental fiscal agencies or any other authority, and a free economy, not operated by government. In the age-old struggle of men to keep free of the dehumanizing domination of government, we of the electric power industry have a unique position. The challenge today requires constant vigilance, intelligence, and the willingness to act promptly against any threats to freedom.

The naked use of force, chains, and shackles are not the most effective techniques of would-be masters of mankind. These obvious methods inspire the will to resist among those not immediately subjected to them. Instead, economic methods are used; the granting of economical favors, or their withholding; the threat of deprivation, the lowering of status, or standard of living; the setting of one group to make use of these methods anywhere in the world as certainly threatens men with ultimate slavery as does any horde of conquerors. Power supply must continue to exemplify the freedom to exercise human abilities, on which our civilization is based.

(Electric utility industry statistics for the next 21 years in this speech appeared in EW, June 16, 1958, p 40.)

to Attain the Industry's 1979 Goals

sented by superconductivity, the fuel cell, semi-conductor converters, the thermionic power converter, and the need for new methods of storing electrical energy. Solar energy has genuine possibilities on a special-application basis.

During the past half century, research and engineering have produced turbine-generator systems that, on the average, use only about one-eighth as much coal per kw as those first turbines which edged reciprocating steam engines out of the picture. These improvements have made electricity the American consumer's biggest bargain. GE's scientists and engineers estimate that a reduction in fuel consumption per kwhr of perhaps 1 to 1½% a year is the best that can be expected in the next ten years.

Many utilities are installing the larger machines now available, and turbine-generators rated from 500,000 to 750,000 kw will come into use in the 1960's. Increased interconnections and the trend to joint purchase and use of high-capacity machines by several companies will produce further advances in system economy.

The laboratories are also exploring new ways to distribute and use electricity. In the factory, in commerce, in the home, and on the farm, the emphasis will be on more automatic equipment, more imaginative and economical use of electronics, bigger blocks of power—homes using the equivalent of today's small industrial and commercial establishments—and higher-voltage, higher-capacity transmission systems. One of the most exciting projects is GE's 3-phase transmission line which will have a rated system voltage of 650,000 v, suitable for operation up to 750,000 v.

But between now and 1979, the industry must sell about $500 billion worth of electricity and $1¼ trillion worth of electrical equipment to reach the goals envisioned. This is about five times as much electricity and four times as much equipment as the industry sold from 1879 to the present.

The most important single obstacle to the industry's residential load objectives is the aggressive competition of the gas industry. Utilities, offering gas and electricity, must see that customers have truly a free and fair choice between electricity and gas. The industry's goals can be achieved only by selling the concept of all-electric living to most residential customers.

But political conditions could so restrict the vigor of the business enterprise system that the national economy would never reach its magnificent potential in 1979. The political challenge from forces hostile to business may outweigh any others in determining the political climate of the 1960's and the 1970's.

Atomic Power—Today's

"Nuclear power is going to come, and in large amounts . . . Never before in the history of our industry has a technological development portended such far-reaching economic, social, and political impacts."

ELMER L. LINDSETH, President, Cleveland Electric Illuminating Co

Predictions as to the time of reaching specific amounts of nuclear kwhr output are uncertain, although one important fact can be predicted without hedging or reservation: Nuclear power is going to come, and in large amounts. Twenty years from now it will definitely be here, and will have significant effects on the American electric power industry. Never before in the history of our industry has a technological development portended such far-reaching economic, social, and political impacts.

First of these impacts is public reaction. The concept of atomic power has caught the public imagination and led to a great deal of confusion. A number of fallacies have gained widespread currency.

One common fallacy is that nuclear power will someday be as "free as air," be "too cheap to meter." But even were nuclear plants built for nothing and nuclear fuels free, it would still cost money to provide electric service. Another fallacy is that abundant cheap nuclear power is "just around the corner," stemming from failure to understand the cost story.

There is also the fallacy that the government could do a better job of our nuclear power program. Two lines of reasoning are current here.

Internationally, there is needless concern over our country's prestige. Many people, among them longtime public power advocates, argue that only a crash program of large-scale government reactors can maintain our world position. But nuclear power is more than a technological development; it is a military and political weapon in the cold war. As an industry, we have been thrust, however reluctantly, onto the international stage.

On the domestic front, many misguided citizens

How Can We Best Raise

"It might be possible to work toward providing a little more than normal added capacity when capital supply seems likely to be relatively easier or cheaper, and perhaps slow down a bit when the reverse were true."

LLOYD D. BRACE, President, First National Bank of Boston

The unfortunate effects of the monopoly power of the labor unions are perhaps best exemplified by the steady increase in wage rates over several decades through threats to halt production in key productivity. Particularly in recent years, unit labor costs have tended to rise disportionately. Here we find the basis for a new rigidity in costs which has boosted break-even points and produced a troublesome "stickiness" in prices.

What might this mean to the economic growth of the nation, upon which, in turn the continued growth of your industry is dependent? Even recognizing the hazards of long-range projections, they must be a key element in investment planning of business as well as policy decisions by government. Perhaps at present, when the economy is in a recessive phase, this may seem to add to the hazards of projecting its growth. I would suggest, however, that over the period to 1965, benefitting from a rising trend of productivity similar to that in our past history—2½% per annum compounded—we might expect to build up to a potential gross national product of close to $550 billion in 1957 dollars.

The basis for our achievement would be our ability to work our way through the present readjustment period without dropping into a depression; and upon the avoidance of inflation. I am more sanguine about our ability to accomplish the former than the latter. The pathway to such a medium-term goal could be considerably roughened, of course, by intermittent inflationary pressures. At times progress might be speeded when prices seemed likely to rise and anticipation of expenditures would be advantageous. When prices appeared to be

Challenge and Opportunity

are heeding the socialized power proponents, who see in nuclear power a chance to nationalize further this country's power industry. Public opinion has never been so important to us as it is today. We need as never before the understanding and support of the public. The people must have a complete knowledge of what we are doing.

A second major impact on our industry will be the ultimate elimination of fuel-cost differentials between areas of the country. As the cost of nuclear power is progressively reduced, it will become competitive first in high fuel-cost areas. Eventually, it will be competitive everywhere. This will bring a major shift in the economic and industrial geography of the United States.

Today such industries as basic metals, alloys, and electrochemicals favor locations where they can most cheaply obtain the large amounts of power they use. But when nuclear power is fully competitive, these industries will no longer be restricted to the low fuel-cost areas of today. Determining factors in their location will be chiefly markets, raw materials, labor force, and available sites. This will give hitherto unknown opportunities to a lot of power companies in their area development programs. Fuel-poor areas will have new opportunities, and fuel-rich ones more competition.

A third important impact will be on our own power system engineering and economics. The new atomic order will affect choice of locations for our own power plants. Fuel supply, delivery, and atmospheric pollution will cease to be the determinants. Nuclear power plants, with no air-pollution or fuel delivery problems, or coal piles, will have greater acceptance by the public in large urban areas. Supersized nuclear plants may come before their capacity can be justified or absorbed on individual power systems. These, in turn, might bring multi-company power pools or transmission networks, the latter probably at 500 to 600 kv.

The fourth impact will be on our industry's financing. Nuclear plants will require higher investment ratios per unit output, and the likelihood of early obsolescence will require more adequate depreciation charges. Research and development will continue to absorb much more money than today, and this money must be recovered. Greater capital investment will require higher demand charges in our rate structures.

The fifth impact will be on our manpower needs. All aspects of our business will be affected—managerial, technical, financial, legal, personnel, public relations. The time is none too soon to start recruiting and developing the men.

Capital in an Inflationary Era?

slackening, there might be a tendency to slow down expansion. This environment, even though it should demonstrate that the broad long-range trend was inflationary, would increase the problems and complexities of business operation to a considerable degree.

What is the probable magnitude of the utility industry's problem? Perhaps a fair estimate of the total new construction needs of the investor-owned utilities for the period 1958 to 1965 inclusive, and assuming installed generating capacity at the terminal year of 160 million kw, would be $40 billion. This would work out to an average annual value for plant expansion more than double that of 1948-1957. It would likewise be about $5 billion more than the total estimated electric utility plant account at the end of 1957.

If we may assume that the industry will generate internally about the same percentage of its total cash requirements for construction as it has in the past decade, the investor-owned companies would have to go to the financial markets for roughly $25 billion. In any one year the range would probably be from $2½ to $4½ billion. Furthermore, if the ratio of long term debt to total capital raised during 1946-1956 were to prevail to 1965, the long-term debt requirements alone might equal more than $16 billion. This would be close to the total capital raised from all sources in the past 12 years.

And what of interest rates? This is a difficult area to forecast. One cannot be very specific. But we may note that interest rates and bond yields have shown an irregular advance since World War II. There have been several surges which have shown successively higher starting and ending points. If this pattern is to continue, one could argue quite convincingly that the next advance might well set another new record, especially since recent peaks are by no means historically high if one looks back prior to the early 1930's. Perhaps the combination of latent inflationary pressures and the potentially strong demand combine to make this a reasonable "guesstimate," particularly if we can assume that the Federal Reserve will exercise reasonable latitude in its credit policy.

It is perhaps presumptuous to suggest that improved methods could be developed. I raise a question, however, whether it might be possible to work toward providing a little more than the normal added capacity when capital supply seems likely to be relatively easier or cheaper and, perhaps, slow down a bit when the reverse were true. Such a course would be desirable only if management were persuaded that business cycles are not entirely a thing of the past.

How Can We Save

"My philosophy requires me to support private ownership of electrical utilities under sound regulation. This does not encompass usurpation of management policies . . . Public ownership would mean a complete change."

ALAN S. BOYD, Chairman, Florida Railroad & Public Utilities Commission

Electricity and its transmission and distribution lines have been described as "the nervous system of modern civilization," and about 75% of this system in the U. S. is investor-owned. But what will this percentage be 25 or 30 years hence? The advent of nuclear energy and the way it develops may have a bearing on this figure.

The consumer provides the main support to free enterprise as opposed to public ownership of power which may be unknowing, but more properly will depend on the manner in which the industry has educated him to the advantages of private ownership. Serious consideration must be given to the desires as well as the needs of the consuming public which pays the bills.

It is not enough to say that the public wants more electricity at less expense. He should be educated by you in such matters as the demand rate, the theory of interruptible power sales, how a fuel adjustment clause operates, and what is the average cost of installing electrical service.

My philosophy requires me to support private ownership of electrical utilities under sound regulation. Sound regulation does not encompass usurpation of management policies. But, due to the fact the generation and distribution of electricity is a monopoly, rules of operation should be established and enforced.

The investor in the electric industry desires continued growth with stable or preferably increasing earnings. Such earnings require sound management, enlightened regulation, and support of the public.

The big question is why should the consumer support privately owned as opposed to public

Federal Power Advocates

"They want more federal power projects to provide more power for those privileged Americans who benefit from the preference clause. And, the larger this privileged group, the more difficult it is to fight back."

STYLES BRIDGES, Senator, New Hampshire

Perhaps nowhere more clearly than in the case of atomic energy have our welfare state advocates revealed their motives. Enough time has elapsed since we began talking peaceful application of atomic power to gain some perspective on the events which have taken place—mostly in Washington. No sooner had we made the decision to concentrate our efforts on the development of the peaceful application of the atom then the advocates of federal power pounced on the atom as a source of energy "belonging to the people."

This is how they justified the development of federal hydro projects. But our hydro potential—at least, that which is economically justifiable—is almost exhausted. The atom was a heaven-sent opportunity to branch out.

Congress has managed to blunt this attack for the time being. But I shudder to think of the bill that would have been run up by now and to which future generations of American taxpayers would have been committed if we had undertaken the proposed program of atomic power plants which could have produced at from three to six times the cost of conventional power.

I don't have to reiterate to you the many and various and devious justifications advanced by the federal power advocates for federal development of the atom. One cannot help asking what has come into our society when such people choose to turn their backs on the record of American industry and choose in its place the bumbling hand of the federal government.

In addition to TVA, REA, Atomic Energy Commission, we also see a steady process of attrition on

Free Enterprise in Utility Industry?

power? Public power is not illegal, it does work, and it may be less expensive.

The basic objection stems from the fact that power is a basic industry. Control of the power industry would mean control of our modern existence. This has been established conclusively by the example of all recent authoritarian governments.

Public ownership on a grand scale would mean a complete change in our way of life. Not only would existing tax structures be inadequate but it would require a most sanguine individual to feel that such a condition could occur without ultimate nationalization of all other major fields of private endeavor.

Primarily, the development of nuclear energy is the battleground of public vs private power. The development of this new fuel for the power industry will be swift. Utility spokesmen assert that full support and free rein be given the industry in conducting research and development in the nuclear field. Since regulatory agencies only establish the rules, what is meant is that the consuming public should be required to underwrite the cost of experimentation.

I feel strongly that this program of research and development should be a partnership undertaking of consumer and investor and not merely a joint venture of consumer and the Atomic Energy Commission. It is far too easy to forget the investor.

This leads me to the advertising program of the industry as it relates to public power. I am no expert in evaluating advertising, but this program strikes me as an attempt to sell oranges by stating what is wrong with apples—a negative approach. It is my firm belief the investor-owned electric industry has the same friends and supporters it had before this program began—and few, if any more, as a result of it. The ads refer to the fact you pay taxes which in turn support and expand your competitors. Who cares?

Unless the consumer is made aware that by this he is adversely affected and that investor-owned utilities perform a better service for the same or lesser charge, the program can do no more than anger the supporters of REA and other public power supporters.

While utility management must answer to the investor, utility regulation answers to the consumer. If we could establish an optimum rate of return for every company, I am sure we would find management would seek more and regulation would provide less in nearly every case.

Sound regulation is of real benefit to the industry and the consumer. Through the prevention or correction of excesses it can save the industry from itself.

Campaign on Many Fronts

your industry by other legislation. Sometimes it is seemingly innocuous, such as Senate Resolution 148. This resolution changes the procedure for evaluating water projects to make it easier to justify federal construction of non-economic projects.

Sometimes the attrition process is buried in a bill, such as the Omnibus Rivers and Harbors Bill which the President vetoed. Sometimes the attrition takes only the form of a staged Congressional hearing.

The fact is, however, that there is a never-ending drive to circumscribe the electric power industry, to weaken it, to make it difficult for you people to remain in business. Your opponents, as you know too well, are even now trying to force you to keep quiet and not talk up in defense of your industry.

The total picture this presents is one of political regulation of an industry outside the legal structure of regulation.

During the past five months the federal power supporters have advanced a new argument to justify the construction of more and more federal power projects. Very briefly, the argument is that the Soviet Union is adding kw at a greater rate than the United States.

Now this may well be true but the logic of trying to equate our growth with Soviet Union growth escapes me. In all arguments citing Soviet progress, one fact is omitted, namely, how does the Soviet citizen benefit from additional power. We have no power shortage in the U.S. In fact, we have ample power reserves. Our rate of expansion is such that it will continue to meet our needs and maintain these ample reserves.

Furthermore, we know why it is we are expanding our power capacity. It is to give our citizens more of the good things of life.

Is this what the Russians are doing? If they are, I can't see any reason to be disturbed. Do we want them to remain peasants? Or do we want them to achieve a better standard of living and perhaps in the process of doing so become less of a menace to us. If, on the other hand, this rapidly increasing Russian power capacity is geared to the production of war weapons, then we have cause to be disturbed, but only because of its objective.

If we decide we need more power for military objectives, we can install it through our tried and proven channels of free enterprise. But you know and I know that this is not what many are thinking. They want more federal power projects to provide more power for those privileged Americans who benefit from the preference clause. And, the larger this privileged class grows, the more difficult it is for you to fight back.

Electric Companies Must

"Let's prepare an ambitious, far-sighted, long-range program of selective selling, designed to load our systems economically . . . Let's be prepared to invest a lot more dollars in sales and advertising."

C. A. TATUM, JR, President, Dallas Power & Light Co

This year about 16 million kw of new capacity will be put in service, and of this amount approximately 12½ million is being added by the electric companies. This is the greatest capacity increase ever added in one year and represents approximately $4 billion of our companies' money. This must be put to work. To do it, we face a marketing job, for which better selling is a must.

What we have to sell is the time of our generators. We can't store our excess capacity. So let's sell it, as much of it as possible, and convert it into profitable revenue.

Two broad avenues are open to us. First, we can induce our present industrial and commercial customers to give us more business. One thing more than all else that will help our customers use more power is automation, or electrical modernization of plants. Many forces are at work to promote automation. We can do a great deal more to push it.

When automation was more of a novelty, one power company in the East flew an airplane load of executives to the Midwest to see a model plant. We also should organize our own people who know something about automation and send them into the plants on our systems with an aggressive program for modernization. We need to do a more imaginative and creative sales job.

Second, a truly great opportunity beckons to us in the residential field, including the existing home market. This field is most productive of net utility revenue and less susceptible to economic readjustments. But the rate of increase of residential load has begun to reflect our lack of attention during the last year. Development of this market is a job we

Rx for a Healthy Old Age

"Rest is the handmaiden of medicine. It should be planned as a part of every day, week, month, and year of active life . . . Getting the mind away from the office is as important as getting the body out of it"

SARA M. JORDAN, M.D., Director Dep't of Gastroenterology, Lahey Clinic

The modern doctor appreciates the superlative value of you men who work hard in the management of business, and we should like to keep you as fit as possible so that the wonderful institution of free enterprise shall be continued by wise men who will reach the promised old age in a state of healthful happiness.

Rest is the handmaiden of medicine. It should be planned as part of each day, week, month, and year of an active life. Modern communication and transportation have brought us a life easier than that of our forebears. But contact with other busy human beings and the noise of our cities have been so increased that escape from fellow man, telephone, and crowded highways to the serenity of the out-of-doors is almost a necessity.

Diverting hobbies and avocations belong with rest as important to modern life. Getting the mind away from the office is as important as getting the body out of it. The ideal diversion gives both mind and body an extracurricular interest. Sports, especially if actively engaged in, are ideal. Personally, I consider golf a splendid antidote to the tension of the executive's life. In older years, a diverting hobby, serious or frivolous, can be a health preserver.

The gaiety of the cocktail party, firmly entrenched in modern social life, is often an artificial substitute for wholesome fun. While alcohol is recommended by many doctors in very moderate quantities as a relaxant for arterial tension, we must remember that studies show that anyone can become an alcoholic. The other social poison, smoking, remains controversial, yet to my mind the data on its relationship to cancer and heart disease are formidable.

Do Better Job of Selling

must do to a greater extent ourselves.

Electrical manufacturers are convinced that to meet today's situation, our industry should provide more initiative, more promotional leadership, more promotion money. Appliance manufacturers, caught in a cost-price squeeze which leaves them a profit of about 2% on sales, point out that any additional spectacular promotional surge must now come from elsewhere. Hundreds of dealers are out of business, and the remainder say, in effect, that if you want this market developed, you must give us more support.

There are no shortages of anything we need to do this job. There is an abundance of appliances and material for building. Consumers have plenty of money in the bank. We don't have to be afraid of selling ourselves into a serious capacity or distribution problem. Surveys show that consumer acceptance of electric appliances is at an all-time high. Customers want more electric kitchens, air conditioning, color television, washers, dryers, and every other appliance that makes housework easier and their homes more livable. One manufacturer reports that the average home has 25% of the lighting it needs, and kwhr use for this purpose alone can be increased 50% in the next four years.

The only shortage that could hold us back is lack of real determination to get the job done, lack of faith that it can be done, lack of inspiration and enthusiasm to get it done. To start the ball rolling on the local level, let's tell our sales departments to prepare an ambitious, farsighted, long-range program of selective selling, designed to load our systems economically and thus aid in sustaining low rates, and with sales goals set much higher than ever before. What services we decide to promote will be a matter for local determination.

Urges Sales and Ad Investment

Let's be prepared to invest a lot more dollars in sales and advertising. Let's increase our sales forces and improve their calibre. Let's see that they do a better job in areas where we need it most right now. Then, let's keep up an active interest in all the problems facing our sales departments and keep on giving them the support they need and deserve.

Finally, on the local level, let's get all our employees in on the act. Let's tell them what we are thinking, what we are up to. Let's sell them harder on the company and make them eager to sell our company ideas to the public.

Nationally, we need an overall, industry-wide sales effort, sponsored by utilities, to capitalize on the present market and meet the many competitive challenges of other industries.

Success Brings Bigness

"Just as you have accepted the role of a regulated monopoly in the classical sense, so have we decided that it's foolish to hide the fact that we are big. Instead we concentrate on positive benefits from our growth."

◀ **ANTHONY G. DeLORENZO,** Vice President, Public Relations, General Motors Corp

Your most pressing problem is government encroachment; ours (General Motors) is bigness. Your problem and ours are two aspects of the same problem.

Just as you have accepted the role of a regulated monopoly in the classical sense, so have we decided that it is foolish to seek to hide the fact that we are big. Instead we concentrate on positive benefits that have resulted from our growth and progress. People seem to forget that success means growth.

Rather than throwing roadblocks in front of successful organizations which grow big, it would seem better to weigh the size of a company in relation to its services to the consumer. The purpose of competition is to benefit the consumer.

But bigness brings high visibility, making us a target for any crusader with an arrow. One arrow is the theory that large companies drive small ones out of business. But no business has done more to foster small business than ours. General Motors alone has 26,000 suppliers, 18,000 automotive dealers, and we have helped to spawn hundreds of thousands of small enterprises.

We are seeking to educate the public to a better understanding of how industry functions as a complicated mosaic of overlapping and interrelated producing and distributing teams. One of the most important links in the network of teams are the electric companies. It is you who have so largely made it possible for man to have machines to do his work for him. I am sure that each of us will continue to be beset by problems, and that you, led by your alert Institute, will make each problem an opportunity for improving your relations with your publics.

Is Your Top Management

"Probably no single thing is so important in assuring this kind of leadership as the right kind of top organization structure . . . free of drones and made of competent people well grounded in modern management."

◀ **S. L. DRUMM**, Executive Vice President, West Penn Power Co

Improvement in the conduct of every single phase of our companies' activities presents a never-ending opportunity and challenge. But our approach should be comprehensive rather than piecemeal, and we must be quick to study the applicability to our companies of new methods and techniques developed by others.

To compete in the money market by obtaining operating results that will earn the support of the investor, an industry, continuing to double in size every decade and needing an estimated $123 billion of new money by 1979, should keep its management methods razor-sharp. An industry under unremitting attack by government power zealots should make full use of modern management tools and techniques to bring about efficient operation. Low rates and good service earn the support of the public and could enable us to say in 1979 as we are saying today—Power Is Our Business.

In an industry whose wages are largely subject to negotiation and whose prices are regulated, with a regulatory lag that works against it in these days of continuing inflation, methods improvement is the area which management is free to move. We should ask ourselves: Are our methods good enough for today; are we searching for improvements and putting them into effect to the optimum? For example, are we, on a planned and comprehensive basis, updating our organization structure, programming the reduction of excess personnel, modernizing purchasing practices, thinking through our policies, establishing service standards, simplifying procedures, keeping marketing methods updated, seeing that our engineering manuals, wiring rules, operating and

Public Relations Problems

"Disasters . . . we thought of as . . . happening to friends, our customers, who had to be helped and informed by any means available that we were working to free them from their sudden plunge into pre-electric living."

◀ **SHERMAN R. KNAPP**, President, The Connecticut Light & Power Co

We are public utilities in the sense that we must deliver our product to anyone who can pay for it. We are publicly owned by anyone with the price in his pants who wants to buy stock. We are publicly responsible to serve our communities and pay our taxes. We are publicly regulated so that our charges for the services we supply do not result in more than a reasonable return on our invested capital.

Incidentally, many people who should know better, believe that regulation means that utilities are guaranteed a profit, and that all we have to do when the going gets rough is to ask for a rate increase. The history of the trolleys, and now the bus and railroad business, denies any such guarantee of profit.

How public can you get? Yet we have allowed ourselves to be labeled as "private" power companies, as distinct from public power operations which are directly or indirectly "government power operations" and whose lifeblood is government credit and freedom from taxes. Some of our problems stem directly from this unfortunate confusion in nomenclature. We say we are "investor-owned," investors being moneyed persons, cash operators who must be rich.

Actually, like most corporations, we are people-owned—by school teachers, butchers, cops, businessmen, young couples and old folks who seek a safe place and a reasonable return for their money. And our product, like air, water, and salt in oatmeal, is noticed most in its absence.

In my company's territory, we have learned to live with disaster—a couple of hurricanes, two devastating floods, and ice storms which left thousands of people without light, heat, freezers, and water. These

Tops? Nothing Is More Vital

maintenance standards, and personnel practices are free of barnacles? Are we making optimum use of labor-saving devices? Are we using controls that really tell us how our units and companies are doing when they are compared with our own norms and industry trends?

We should ask ourselves, too, whether our methods will be good enough for tomorrow and, make ready for needed changes. In the next decade we must add the equivalent of the electrical facilities that we have been building for three-quarters of a century. In the decade beyond that, we face the prospect of adding facilities approximately twice those we now have, bringing our electrical size to about four times that of the present time.

With this growth may come need for making substantial changes in organization structure and in assignment of responsibility for various functions, including manning; need for going toward more or less decentralization with clear definition of line-and-staff responsibility, better communications, and increased codification of policies, procedures, and standards; need for engineering decisions based upon clear vision, readiness to change, and a long look ahead; and need for raising sums of money that dwarf what we are now raising.

For a company to be out front, its top management should work everlastingly at it. By "top management" we do not mean presidents only, but rather the entire upper-level team which includes most, if not all, of you. Top management should constantly motivate, organize, plan, prod, and then control.

With leadership and motivation the search for better methods becomes part of the company's way of life.

Topside People Must Be Best Obtainable

Probably no single thing is so important in assuring this kind of leadership as having the right kind of top organization structure. The span of responsibility of each member should be such that one person can handle it adequately. Responsibility for functions should be carefully assigned with like things grouped together with a well-understood separation of line-and-staff functions. The top executive staff should be free of drones and made up of competent people well grounded in modern management techniques.

In the process of staffing the top organization, no one can afford the luxury of waiting for years for death and retirement to open the way for what must be done.

Solved by Private Understanding

disasters presented huge public relations problems. But we thought of them as private relations problems, things happening to our friends, our customers, who had to be helped and informed by any means available that we were working to free them from their sudden plunge into pre-electric living. Perhaps this experience has made me doubly conscious that public relations begin with private understanding between a company and its customers.

I do not profess to be an expert in public relations, although I have become increasingly aware that every business, cause, campaign, drive, and everyday operation must learn to move within the limits of public understanding. I am, however, an avowed expert on The Case of Manresa Island. I had to be. This case seems to have become a classic in public utility operations with the public. It had everything, embodying every branch of law and public communications, from the first stirrings of local sentiment to a place on the ballot in a city election. In the struggle for public opinion, just about every tool in the kit was used. It is too simple to say that we won by "enlisting public understanding." Some of the things we did, or said, or stood for, somehow reached the thinking people, whose own understanding created public decision that could finally be tabulated on a voting machine. We learned that you can't possibly reach everybody, but you can reach the somebodies who really make up the public mind.

Only about a third of the industry's customers are now served by companies participating in the four national organizations. I am surprised to find how few of our utility people know the cost of participating. The four-group total costs less than a tenth of 1% of my company's electric revenue and, as we say about electricity itself, it is one of the biggest bargains in our family budget.

Sees Public Power Scared

We are seeking, and I believe we are capable of obtaining, far greater public understanding and support of our private enterprise philosophy than exists today. The way to that goal is two-fold; doing the best job we can and recognizing our responsibilities as citizens in the communities we serve; and through cooperative action on all four fronts at the national level.

The recent ruling of the Internal Revenue Service concerning the non-deductibility for tax purposes of ECAP expenses, instigated by Clyde Ellis, Estes Kefauver, et al, shows that the government giant power crowd is running scared. If there was ever a time when a united front at the national level was needed to keep the ball rolling, it is now.

Only Plain, Strong Talk

"To the average customer there's not a bit a difference between public and private power service. When he flips the switch, he expects the lights to come on. And they do! That's enough for 90% of the people."

ROBERT R. GROS, Vice President, Pacific Gas & Electric Co

If we don't do something about public opinion now, our industry as we know it today cannot survive more than two generations—three at most. If we do not respond with hard-headed acceptance of reality, the heretics, economic meddlers, and Socialists will take from our children their birthright. Indeed our children will help them.

These will be the years of our countdown; the declining cycle of digits along an oak-paneled, deep-carpeted, genteel countdown to oblivion.

Let's not delude ourselves that we stand at ten—at the top of the countdown. The fearful statistic, that a fourth of America's power is government generated, means that the echo of eight is dying in the distance, and seven is half risen in the throats of our destiny.

Only two more counts now will tip the balance of power. Then we—yes, we—shall be the minority.

To the average customer there's not a bit of difference between public and private power service. When he flips the switch, he expects the lights to come on. And they do! That's enough for 90% of the people, and that's more than enough votes to win an election.

But until we stop writing copy for ourselves and start talking the people's language, we'll never make real progress in getting an audience for our message.

We must recognize and utilize the expertness of the public relations man. Successful public relations depend to a large extent on how management uses its PR men. Are they merely editorial supervisors of advertising and publicity copy, making sure that clever and proper language is used? Are they only

Informed Employees Can

"The employee is the key to a properly informed public . . . An employee information program is the one most effective way to stem the tide of invasion of public power and to preserve the American economic system."

CHARLES E. OAKES, Chairman of the Board, Pennsylvania Power & Light Co

Our industry for many years has been in the first line attacked by those who would like to remold the structure of our American society. While we have been sensitive to their motives, we have been somewhat less than completely successful in translating their objectives effectively to the public mind. Couched in obscurities made possible by the complexities of our modern society and abetted by the false cloak of promoting the public welfare, these advocates of federalized human endeavor have accomplished much. The results can be found in the infusion of governmental control concepts into all parts of our political and economic life.

The most important long-term problem facing the electric utility industry is this continued invasion and growth of public power in our field of endeavor. In the long-term view, Congress must answer to the weight of public opinion, and an informed public opinion starts with the individual voter. The individual voter is also our customer.

Every employee of a public utility should believe in the cardinal principle that electric service to the public can be rendered better, at the lowest overall cost and more efficiently, by private industry than by a government agency. The employee is the key to a properly informed public.

It is our duty as executives and supervisors in this industry to assemble and present the necessary facts, to see that every employee is completely informed, and to instruct him in the manner and ways of transmitting these facts to the public. National surveys show that only 8% of our customers say that they have been talked to by an employee. This 8% should be advanced to 75% in a five-year program. An em-

Can Disrupt Countdown to Oblivion

abject flunkies to alibi any kind of a policy management decides to carry out, regardless of public opinion? Are they just nice, congenial, hand-shaking and back-slapping machines who make a lot of friends, buy everybody drinks, but do not influence many people?

Public relations is a broad and comprehensive field, and a true expert must have a sound, practical knowledge of the human equation. Once he has proved his expertness, his advice ought to be heeded instead of being side-tracked for the horseback opinion of the engineers, lawyers, and auditors. Instead of publicity material being made to clear legal departments, maybe it is time to consider making some of our legal activities clear with public relations to avoid the loss of millions of dollars of good will.

Let's look at the PR angle to the tax question. There is no evidence that the tax differential ever has impressed a single consumer not otherwise influenced. Everything we say on the subject sounds as if we're complaining or bragging, or both. The consumer merely says, "What's so noble about paying taxes. I pay mine too—plenty. I'd like to see somebody get out of paying taxes."

We all know the issue between capitalism and socialism. We know who our enemies are and have no difficulty penetrating their various masquerades. We know their goal is to remake our nation in the monstrous image of the all-powerful socialist state.

Rev Billy Graham doesn't waste his time talking just to the believers. As a missionary, he works primarily among the non-believers, those who have strayed from the fold. We in the industrial public relations field talk a lot, but too often we say what we have to say in our own temples. We preach conversion to the converted.

Time Is Running Shorter

As much as this thing we call public relations has been my daily work in our industry, the investigation and exposure of the cancerous conspiracy of socialist collectivism has been my life's avocation. My firsthand probing of the global struggle for the mind of man has taken me to many corners of the earth and on both sides of the Iron Curtain. I could resort to polemics, to deluging you with statistics, to rafter-shaking exhortation. Instead, speaking as an electric utilities public relations man, I choose to plead simply that we have a duty to the American economic system as well as to our own industry. We can't afford to waste any more time before halting the countdown to our own oblivion.

Let's go home, take off our coats, roll up our sleeves, and fight back!

Aid in Federal Power Fight

ployee information program is the one most effective way to accomplish the job of stemming the tide of invasion of public power in our business and of preserving the American economic system.

If the utility industry succumbs to the public power threat, the natural gas industry, the oil industry, and other extractive industries will be next.

If an employee information program is placed in charge of top-level management, is adequately staffed, and a thorough training program instituted to cover the entire personnel in every company, the morale and esprit-de-corps of every utility will be greatly improved and the level of understanding by the public of the electric utility industry will be immeasurably increased.

If we can reach a goal whereby 75% of our customers know and talk to our employees, who are thoroughly trained in the knowledge of the American enterprise system and of the public utility industry, we can solve the problem of invasion of the government in our business and reap the benefits of an organization with an ever-increasing efficiency in the conduct of our business in service to the public.

Thirty years ago we dismissed lightly the theory that governmental policies were leading to destruction of our freedom. Today we no longer have a theory—we have the condition. Can the already destructive damage be undone? Can further erosion be arrested and prevented? What can we as responsible people do about it?

Perhaps the most effective effort is to provide the way for our employees to gain a better understanding. Given a better knowledge of our American system and the important role our industry plays in our national scene we should urge them to make their views known within their own civic and social circles.

They should be encouraged to lend their support to public officials of integrity who stand for the preservation of a free America. We must recognize that it is the decisions of the millions of our people, each exercising his own individual right of expression, that in the end determines the kind of nation we are ultimately to have. Our industry is very close to every community throughout the land. We can reach into these communities in an intimate way.

There is, in my opinion, a close tie between understanding the issues and good citizenship. And there exists an abiding relationship between good citizenship and improvement in our social and economic system. It takes but a moment's thought to realize that the peoples of the world have maintained dignity and decency in their relationships with others in proportion to the degree in which they have been able to hold to democratic principles.

Blames Moral Indifference For Drift from Social Health, Sanity

"Tendency of the business manager, in common with other citizens, is to be complacent about advance of piece-meal socialism—political intrusion that doesn't encroach on what he conceives to be his own territory."

ADMIRAL BEN MOREELL, Chairman of Board, Jones & Laughlin Steel Corp.

Over-extended government, excessive taxation, politically engineered inflation, mistaken ideas about economics, moral confusion, personal liberty in decline, and a growing political idolatry spell our national predicament today.

Where lies the blame?

Over the past 50 years all of us have encouraged, even participated in, the propagation of a misplaced faith in the power of government to accomplish all sorts of social, economic, and moral purposes. We implemented this faith by thrusting enormous powers upon government, or acquiesced in those powers. Such an enhancement of political at the expense of social power is socialism.

The tendency of the business manager, in common with other citizens, is to be complacent about the advance of piece-meal socialism—political intrusion that doesn't encroach upon what he conceives to be his own territory. We tend to be apathetic about the general socialistic drift and even actively support socialistic measures under the delusion of promoting prosperity.

Our country today is in a crucial struggle for survival, and the issue will be decided in the arena of moral values—not on the field of battle. The situation has been described by one of our military commanders: "It is the sort of moral crisis from which one merits the victory only when there is no longer a wide and embarrassing gap between one's stated aims and one's personal example."

We Move Toward Police State

Today America is moving rapidly toward a police state. Many people have been converted to the idea that freedom has been tried and found wanting. Many subscribe to the concept of the New and Fair Deals—that by substituting man's law of force for God's law of love, people can be coerced into helping their neighbors.

If the trend toward the police state does not frighten us, then we get ulcers from some of its by-products: Corruption in high places, juvenile crime, the perpetual world crisis, the cruelly oppressive tax burdens. Macaulay, addressing himself to America, said:

"Either some Caesar or Napoleon will seize the reins of government with a strong hand; or your republic will be as fearfully plundered and laid waste by barbarians in the 20th century as the Roman Empire was in the fifth;—with this difference, that the Huns and Vandals who ravaged the Roman Empire came from without, and that your Huns and Vandals will have been engendered within your own country by your own institutions."

While I am convinced that disaster lies ahead unless we change course, I firmly believe that the world is now on the threshold of what could be such a dynamic expansion of spiritual growth and material productivity as to tax the capacities of all mankind. The world looks to America for moral leadership. We can supply that leadership if we emulate the Founding Fathers in their devotion to "justice, moderation, temperance, frugality, and virtue" and "frequent recurrence to fundamental principles." No one, no matter how exalted, can determine for 172 million people their day-to-day economic and social decisions. I propose that these decisions be returned to the persons concerned in these steps:

Here Are Steps Back to Freedom

Let us end all further private raids on the public treasury, whether by unions, businessmen, farmers, or others. We need only refrain from passing more socialistic laws.

Let us undertake at once an orderly demobilization of the bureaucracy by the progressive repeal of socialistic laws. This, the road back to social health and sanity, will be a struggle all the way. Every pressure group will fight to retain its special privileges. But if freedom is to live, politically privileged positions must go.

Of the powers that remain in government, let us return as many as possible to the states. On the local level, people can apply more critical scrutiny to the acts of their government agents and take corrective action.

Let us resolve that never again will we yield to the seduction of the government panderer, offering gifts paid for with our own money, for a surrender of natural rights.

Let us hold high the banner of individual moral responsibility, acknowledging that unless each of us humbly tries to govern his actions by God's moral code, he brings chaos into society and invites tyranny.

You get delivery in just 8 weeks on RM standard-design medium transformers*

*Non-standard medium transformers (501 to 7500 kva, 69 kv and below) require 12 weeks shipping time.

General Electric Co., Schenectady 5, New York. 416-21

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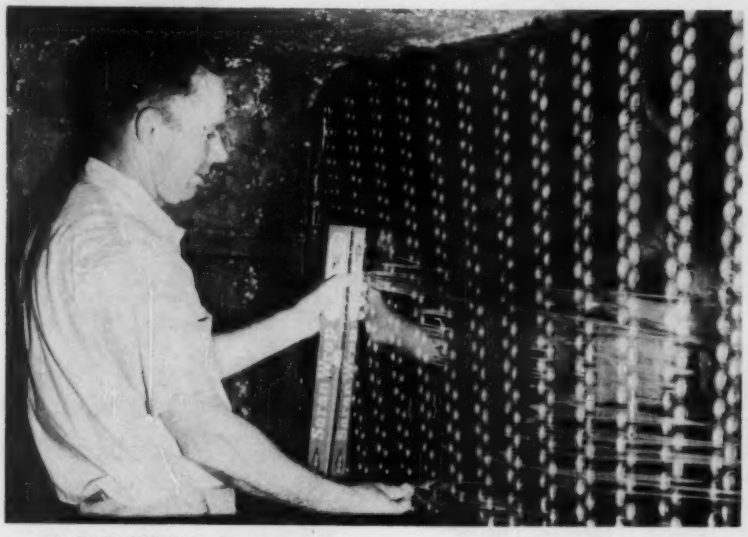
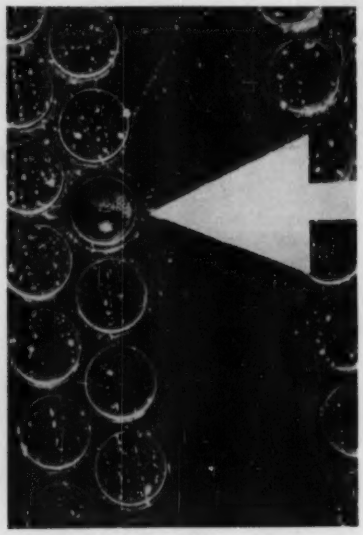
GENERAL ELECTRIC





PLASTIC SHEET laid on in rows over entire tube sheet of condenser half . . . is pulled into end of leaking tube

Locate Tube Leaks with Unit Operating

DAMON M. TATEM, Operating Supervisor, Portsmouth Power Station, Virginia Electric & Power Co, Portsmouth, Va.

Tube leaks are located quickly in divided water-box condensers while the unit remains in service, with a method developed by Virginia Electric & Power Co. A thin, transparent plastic sheet (Saran Wrap) is placed over the tube ends in half of the condenser. Vacuum in the leaking tube pulls the plastic into the tube end and thus locates the bad tube. Vepco has adopted the method for use at all stations employing salt water for cooling.

The simple method was developed by personnel at Portsmouth Power Station after many methods and materials were tried. Under the new procedure, load on a condenser known to be leaking is reduced so that one half can be removed from service. This half usually can be found before reducing load by recording condensate conductivity as sawdust is injected into one half of the water box. If both halves indicate leaks, the method is followed for each separately.

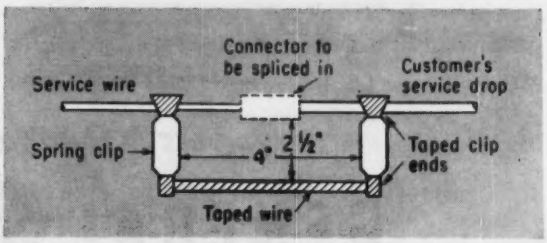
With a condenser half removed from service and drained at both ends, three operators, working together, cover one entire tube sheet and then the other end with plastic sheet. The plastic may be applied and smoothed more easily when tube sheets are wet.

As a vacuum builds up, the plastic is pulled into a leaking tube. The degree of indentation often is small for minor leaks; nevertheless, it can be seen readily. Leaking tubes then are plugged and the condenser half returned to service. By using the plastic sheet, Vepco has been able to stop leakage from tubes in a few hours and without shutting down the unit.

Hold Service Drop and Loop For Ease in Splicing

HARRY BATTIS, Worcester County Electric Co, Worcester, Mass.

Loose ends of the service drop and service loop wires may be held together for splicing with a simple wire holder being used by Worcester County Electric Co. The device illustrated consists of two 100-amp universal-type spring clips and a 6-in. length of No. 3 HD copper wire. The solder end of each clip is twisted 90 deg and soldered to the wire. Solder ends and the wire are covered with rubber-like tape to provide protection against a possible contact hazard.



(*More How To on page* 104)

keep an eye on
SYSTEM VOLTAGE

SANGAMO LINCOLN THERMAL VOLTMETERS

are the key to economical system planning

Utility engineers need reliable information on system voltage to solve present distribution problems—maintain specific voltage levels—anticipate tomorrow's voltage requirements. Sangamo Lincoln Thermal Voltmeters are the lowest cost means of obtaining accurate, continuous knowledge of the voltage spread at check points throughout your system.

Permanent Installations of Sangamo Lincoln Thermal Voltmeters give you these benefits:

- *Continuous record of voltage conditions*
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- *Economical socket installation*
- *Simple reading—quick resetting*
- *Reduction of expensive service calls*
- *Elimination of costly periodic surveys*

Ask your Sangamo Representative, or write us for full information on Sangamo Lincoln Thermal Voltmeters and other Sangamo equipment for system betterment.

BILL OF MATERIAL

1—V2S* Thermal Voltmeter. $30.74

1—Standard Meter Socket . . . 2.92

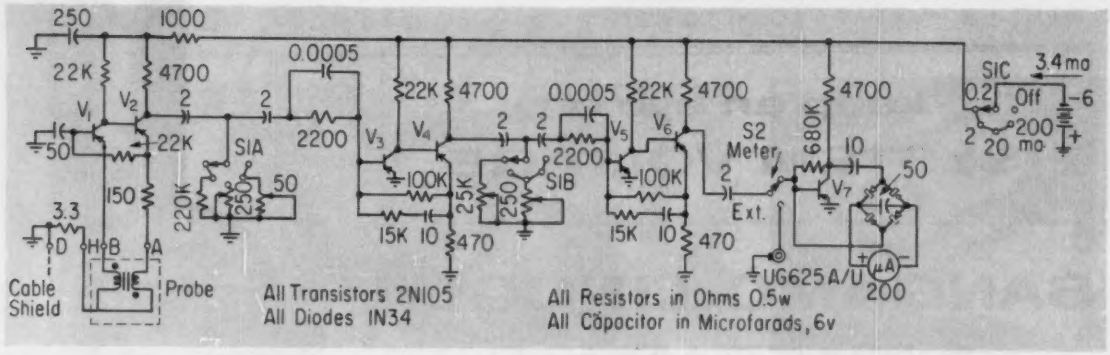
**Used where outages are not a problem.*

1—V3S† Thermal Voltmeter. $42.34

†Minimum reading not affected by outages.

SM58-4

SANGAMO ELECTRIC COMPANY *Springfield, Ill.*



TRANSISTORIZED METER uses a feedback network in the intermediate stages to help stabilize low-frequency gains

Microammeter Covers Wide Frequency Range

A portable, battery-powered, transistorized microammeter developed at the National Bureau of Standards provides a rapid and convenient method for measuring small alternating currents in the range from 50 cps to 100 kc. Current pickup for the meter is a miniature split-core transformer that can be clamped onto a wire.

Lowest range of the prototype instrument is 200μa full scale; on higher ranges it can accurately determine currents up to 200 ma. Linearity of the entire instrument is within the 2% specification of the indicating meter. The instrument is based on the probe-amplifier-meter concept and is transistorized for long life and modest power requirements.

The transformer core consists of 0.014-in. silicon-steel laminations, formed of matching C and I-shaped sections. The I-sections close the gap of the C-sections when assembled. The completed core, 5/16-in. square, ⅛-in. thick, with a ⅛-in. window, is mounted in a spring-loaded bakelite clamp, about the size and shape of a wood clothespin. Shielding with mu-metal minimizes sensitivity to external magnetic fields.

The core C contains two windings each having 250 turns of No. 44 enameled wire. The four coil leads connect to a shielded four-wire cable and plug. One winding on the core (the secondary) provides the current pickup, while the other (the tertiary) is part of a feedback network to provide frequency equilization. Through use of this tertiary winding, transformer output is very nearly linear from 100 cps to 100 kc.

The high-frequency limit is imposed mainly by limitations of the transistors. However, even with high-frequency transistors, maximum operating frequency is probably not more than three or four times the transformer resonant frequency of 120 kc.

Transformer output is fed into a preamplifier consisting of two transistors and a feedback network. Gain in this stage is sacrificed to provide frequency equilization and to reduce phase shift at the higher frequencies. Gain is provided by two intermediate stages, each using a pair of transistors. Each stage uses direct coupling from the first transistor to the next.

The indicating meter has a 200-μa dc movement and is driven through a full-wave rectifier operating in a non-linear region. Non-linearity is effectively reduced by a one-transistor amplifier whose gain is sacrificed to provide negative feedback through the rectifier. Insertion impedance to be used with this microammeter is almost entirely resistive over the useful frequency range.

Parallel Older Transformers to Extend Life

W. H. JOHNSON, Head, Distribution Engineering Section, American Electric Power Service Corp, New York, N. Y.

To meet the load growth, considerable savings can be realized by utilizing the remaining life of surplus 2,400-v transformers in parallel with installed units. It is far more expensive to replace existing transformers with new double-capacity 2,400-v transformer units.

Conversion from 4 to 12-kv distribution usually produces an excess of 2,400-v transformers, particularly 7½-kva and smaller units, which are not salable except as "junk." Tanks of some surplus 2,400-v transformers can be used to reduce the cost of new 7,200-v transformers by about 20%. New 7,200-v core and coils can be assembled in reconditioned tanks.

Much better utilization of surplus transformers can be obtained with large cash savings in many cases. For example, where load growth requires increasing the rating of transformers, surplus units may be paralleled economically with installed

(*Continued on page* 107)

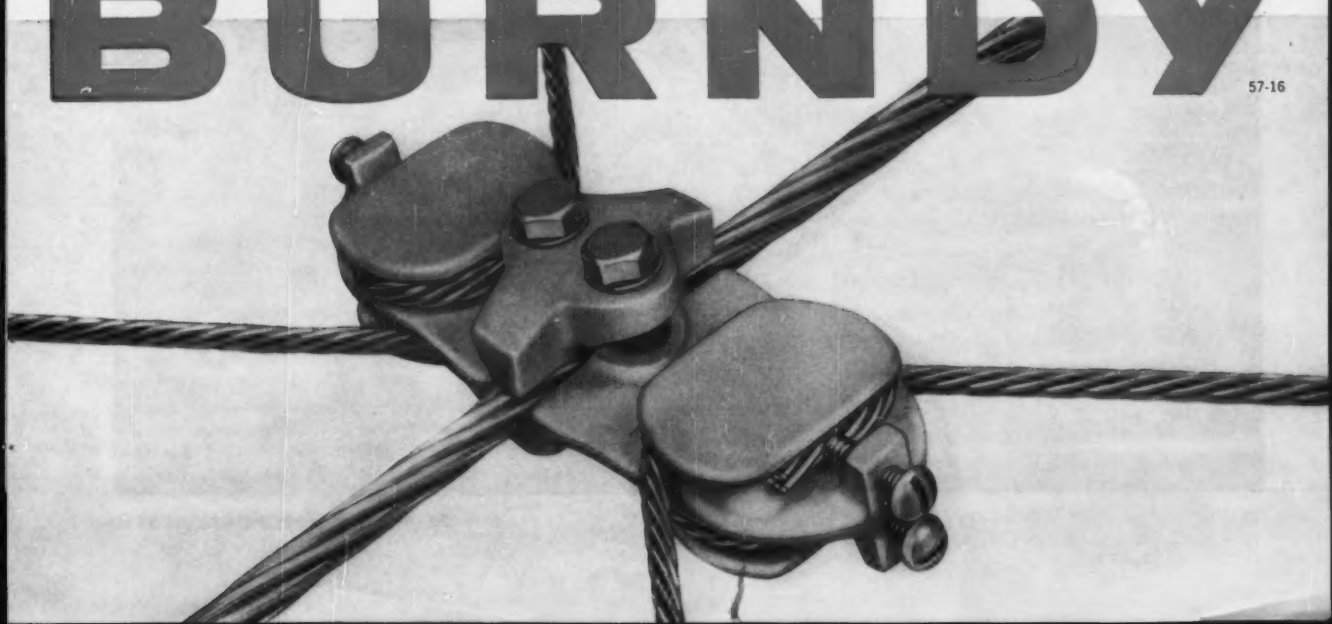
SPANTAP

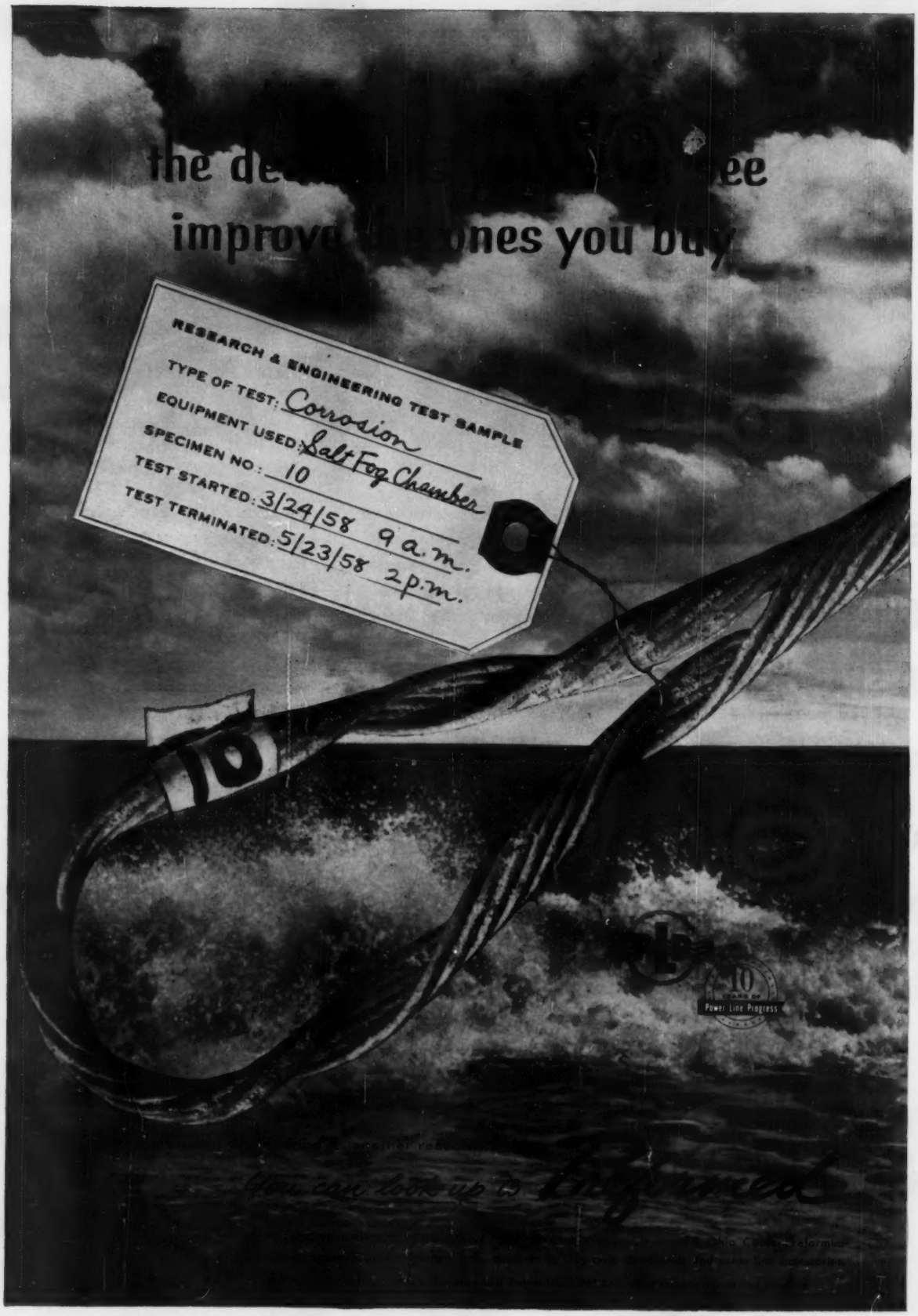
first fully engineered MID-SPAN TAP for cabled secondaries

- The phase SPANTAP, above, is installed on the run by tightening a single bolt! The insulating cover halves snap together...securely held by humpback cotter pins. Knockouts in the insulating cover permit insertion of taps without removing this cover!
- Up to 4 individual taps can be taken from one SPANTAP! Each service can be added or removed from the installed and fully-insulated SPANTAP... at any time!
- The stripping length for each tap is indicated on the face of the cover! The connection is made secure by tightening pressure bar assembly from the bottom of the SPANTAP.
- One neutral SPANTAP, below, deadends and connects up to 4 service drop neutrals to the neutral of the secondary — without disassembly of the connector.
- The service drop neutral is wrapped around the SPANTAP V-groove which produces a wedge-locked grip on the conductor. As stresses increase, the simple connection grows tighter!
- No further gripping action is required but the neutral SPANTAP has an anchor screw to secure each connection against severe winds and storms!
- Write for complete technical specifications. Burndy, Norwalk, Connect., Scarboro, Canada.

BURNDY

57-16




the de ee
improv ones you bu
RESEARCH & ENGINEERING TEST SAMPLE
TYPE OF TEST: Corrosion
EQUIPMENT USED: Salt Fog Chamber
SPECIMEN NO: 10
TEST STARTED: 3/24/58 9 a.m.
TEST TERMINATED: 5/23/58 2 p.m.
10
10 YEARS OF Power Line Progress

Paralleling Old vs Using New Double-Capacity Units

	Case I— 5-kva Units	Case II— 7½-kva Units
Reconditioning surplus unit	$10.00	$10.00
Installation*	17.10	21.68
Stores and overhead	12.00	15.00
Total	**$39.10**	**$46.68**
New unit, initial cost and installation*	$199.68 (10 kva)	256.10 (15 kva)
Removing old unit	8.24	9.83
Stores and overhead	18.00	23.00
	$225.92	$288.93
Salvage of old unit	44.00	57.00
Total replacement cost (net)	**181.92**	**231.93**
	−39.10	−46.68
Saving by Paralleling	**$142.82**	**$185.25**

* Based on mounting transformers directly on poles.

Extend Useful Life

(*Continued from page* 104)

units of the same rating by attaching them directly to existing poles and using present cutouts and arresters. Such utilization is much less expensive than replacing existing 5 and 7½-kva units with larger sizes.

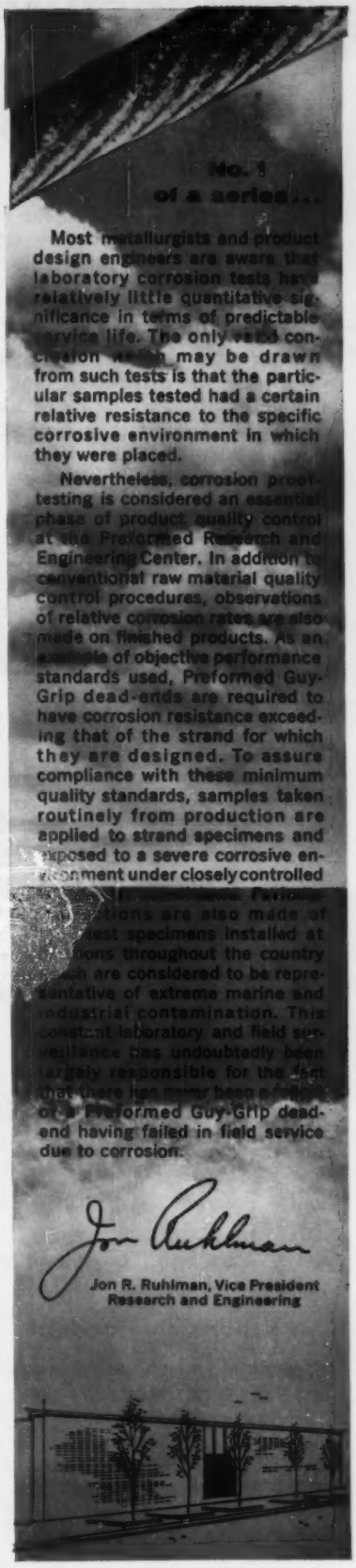
The two cases tabulated indicate that existing 5 and 7½-kva units can be paralleled with cash savings of $143 and $185 respectively. Salvage in both cases is the credit for the tank of the replaced transformer. If old tanks are not used for uprated or equivalent new 7,200-v units, only the junk value of the replaced transformers can be credited against the cost. Then, total replacement expenses become larger, and paralleling surplus transformers with existing units of the same rating offers greater cash savings.

Furthermore, the suggested utilization of surplus 5 and 7½-kva 2,400-v transformers avoids junking of good cores, coils, and bushings. Because not all tanks are suitable for uprating to 7,200 v, useful life of surplus transformers is not wasted. This reasoning should apply also to other sizes of 2,400-v and the smaller sizes of 7,200-v transformers.

Red Tape Helps Prevent Burnouts

Strips of red cellulose-tape help prevent costly burnouts of metering equipment and distribution transformers at Pacific Gas & Electric Co's San Francisco Division. A strip marks a demand meter dial on demand-metered circuits at a reading corresponding to an overload of meter current coils, current transformers, or the distribution transformer, whichever is the smallest. If the distribution transformer supplies other loads, the demand meter is marked at the metering equipment rating only. Average values of power factor are assumed to fit the majority of cases.

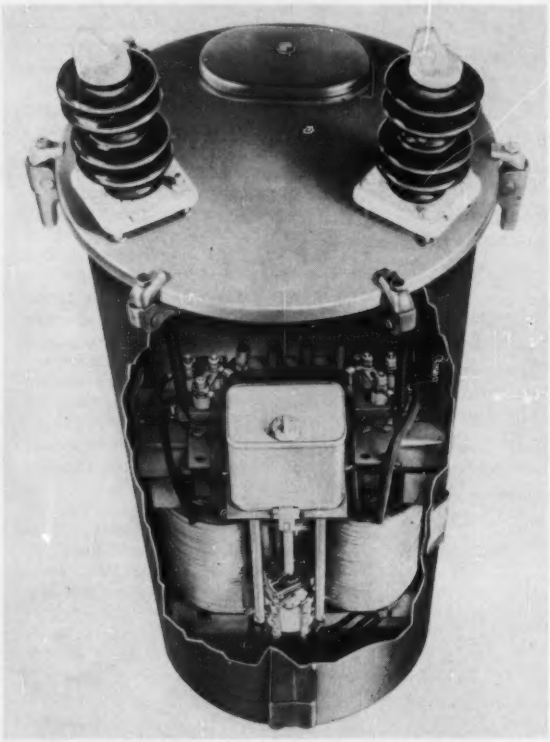
In three years, PG&E has replaced many current transformers based on reports of readings beyond the red tape. Only one distribution bank has been changed out. Many reports and subsequent recording ammeter checks have led to marker advancement, with the expectation that the banks will show up overloaded again shortly and then may be replaced.


No. 9
of a series...
Most metallurgists and product design engineers are aware that laboratory corrosion tests have relatively little quantitative significance in terms of predictable service life. The only valid conclusion that may be drawn from such tests is that the particular samples tested had a certain relative resistance to the specific corrosive environment in which they were placed.
Nevertheless, corrosion proof-testing is considered an essential phase of product quality control at the Preformed Research and Engineering Center. In addition to conventional raw material quality control procedures, observations of relative corrosion rates are also made on finished products. As an example of objective performance standards used, Preformed Guy-Grip dead-ends are required to have corrosion resistance exceeding that of the strand for which they are designed. To assure compliance with these minimum quality standards, samples taken routinely from production are applied to strand specimens and exposed to a severe corrosive environment under closely controlled
Jon R. Ruhlman, Vice President
Research and Engineering

New L-M Transformer is Self-Regulating

A radical new self-regulating distribution transformer, that senses voltage at the utilization level and maintains an average secondary voltage of 120 v by actuating a tap changer connected to the primary winding, was demonstrated for the first time to a group of utility executives in Chicago, last week, by Line Material Industries, McGraw-Edison Co.

The new transformer, probably the first of its kind in the world, was designed by Line Material Industries as a means of improving distribution service quality. The "SRT" transformer is a standard Round-Wound unit with additional internal features to make it self regulating. Regulation is accomplished by automatically changing the transformation ratio in 2.5% steps over a voltage range of 10%. Effective band width is 3.5 v, centered around a base voltage of 120 v. The regulation range of 10% can be manually selected to be from 90% to 100%, with respect to rated primary voltage, or from 95 to 105%, or from 100 to 110%.



Operating features of the design include a time delay, which prevents hunting and unnecessary responses to momentary voltage fluctuations. This time delay is approximately 40 sec for the first tap change from neutral but 20 sec for subsequent changes in the same direction. The design provides temperature compensation for operation over a range of −40 C to +150 C.

Brain of the SRT is a small box connected with two leads to the transformer secondary. It performs three functions: (1) Senses secondary voltage, (2) pumps hydraulic fluid and (3) drives tap changer shaft.

Energy losses in the SRT, over and above losses in conventional transformers, are independent of transformer loading and voltage, nominally 12 watts per unit. All testing to date indicates that SRT's will be relatively maintenance free, it was stated.

Principal areas of application are: (1) At the end of long lines, (2) where load variations cause erratic voltage, (3) in lieu of a regulator on a long line with few consumers, and (4) to maintain voltage levels in rapid load growth areas. Judicious use of SRT's with regulators will maintain voltage on long lines and permit greater spacing between regulators.

Voltage ratings of the first SRT's range from 2,400 to 14,000 inclusive. Kva ratings are from 10 through 100. The first units will be marketed on a nationwide basis to permit field testing under a variety of conditions. As operating experience is accumulated, periodic reports will be made available to the electrical industry. Full scale production of these new transformers will be undertaken upon completion of the test program.

An approximation of the cost of the SRT distribution transformer can be had by increasing the net price of a standard conventional transformer with taps by about 6%, then adding $50, according to a Line Material Industries spokesman.

ASA Reports on Standards

American Standards Association, New York, reports the status of six American Standards.

Published—(1) Requirements for Power Circuit Breaker Control, C37.11-1957, price $0.80. (2) Definitions of Electrical Terms (Partial revision of C42-1941)—Group 55, Illuminating Engineering, C42.55-1956, price $0.60; Group 65, Communication, C42.65-1957, price $3; Group 95, Miscellaneous, C42.95-1957, price $0.80. (3) Electrical and Dimensional Characteristics of Outdoor Apparatus Bushings (Used with Power Circuit Breakers and Outdoor Transformers), C76.1a-1958, price $0.50.

Approved—Method for the Designation of Miniature Lamps, C78.390-1958.

In Standard Board—(1) Specifications for Metallic Coverings for Insulated Wire and Cable, C8.15 (Revision of C8.15-1942); (2) Residential Wiring Handbook, C91.1.

(*More Manufacturers News, page* 155)

How service conscious utilities are using Graybar facilities to SAVE MONEY

With operating economy and the improvement of customer service uppermost in their plans, electric utilities are making ever-increasing use of Graybar warehousing and service facilities.

Use of Graybar's multiple warehousing, nation-wide, helps utilities to save on space, inventories and operating personnel in their own stockrooms.

With many utilities, personal contact with their Graybar sales representatives is a daily, almost an hourly, routine. If emergency strikes, Graybar men use their coast-to-coast organization to fill and expedite orders. When expansion is in the plan stage, Graybar men help with last-minute news of latest equipment. And, as the construction jobs get under way and crews are shooting for completion dates, Graybar people help by seeing that the right materials are delivered when they're needed.

On the following pages you'll find some of the quality electrical products distributed through more than 130 Graybar offices and warehouses. Your inquiries on these, and any other top-grade electrical items are always welcome at any Graybar office.

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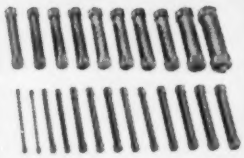
IN OVER 130 PRINCIPAL CITIES

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical Graybar



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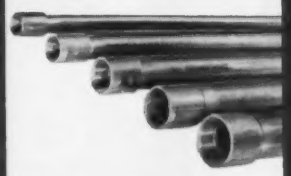
Everything Electrical · GraybaR

Bus Conductors and Accessories



New, Economical, Color-Coded Alcoa Aluminum Conduit

QUESTIONS OF 1958

Q. HOW CAN I SAVE MONEY?

A. *By buying from one source of supply, Graybar can give you complete service on dependable Alcoa® ACSR, covered triplex and line wire, accessories, bus conductors, conduit and tools.*

Q. WHERE CAN I GET FAST SERVICE?

A. *FROM YOUR LOCAL GRAYBAR OUTLET. Graybar now features same-day delivery of electrical items from a complete stock of Alcoa Aluminum Conductors and Accessories.*

Q. WHAT BRAND IS BEST?

A. *ALCOA. ALCOA OFFERS A BIG BONUS IN EXPERIENCE. Many years of research and engineering are built into every Alcoa product. This means big savings to you in long, trouble-free operation.*

Remember

Distributed by GraybaR ELECTRIC COMPANY

the next time you need fast, economical service on

ALCOA ALUMINUM ELECTRICAL CONDUCTORS and ACCESSORIES — ALUMINUM COMPANY OF AMERICA

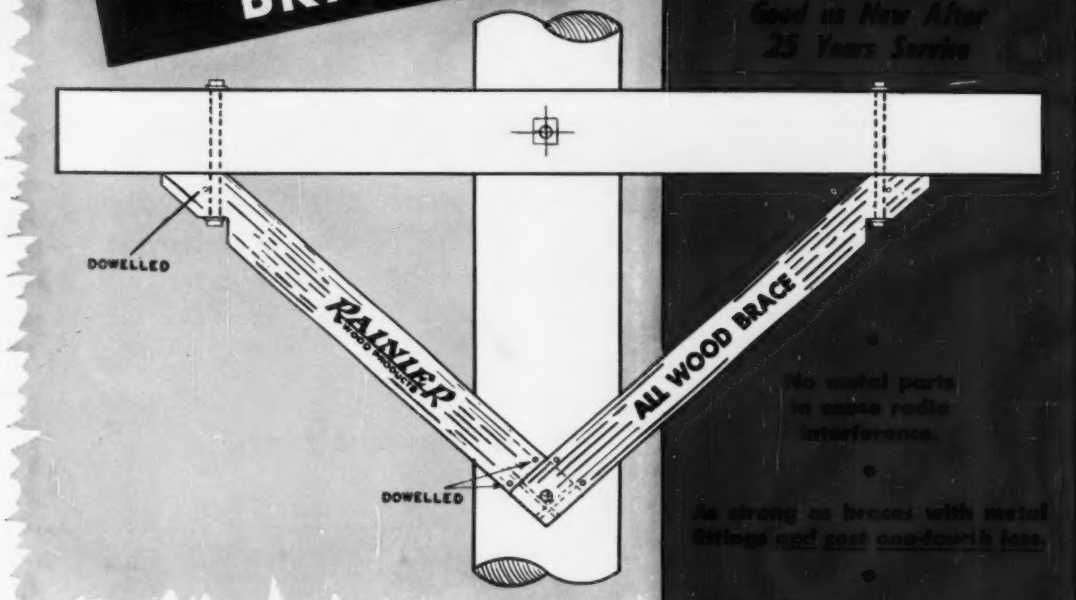
Your Guide to the Best in Aluminum Value

Always use Alcoa Aluminum Accessories with aluminum conductors.

"ALCOA THEATRE"
Exciting Adventure. Alternate Monday Evenings

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

RAINIER WOOD PRODUCTS CROSSARMS BRACES



ALL WOOD BRACES

Good as New After 25 Years Service

- No metal parts to cause radio interference.
- As strong as braces with metal fittings and cost one-fourth less.
- No right- or left-hand members. Any two pieces make a pair.
- Bolt holes reinforced with spiral dowels.
- Manufactured from seasoned, straight-grained Douglas fir.
- Double pole rail WOOD BRACES furnished on request.

4 Facts About Rainier Crossarms

SELECTION — Extra value in crossarms, as in many other quality products, is the end result of planned manufacture. With this company the careful selection of timber for manufacture of Rainier crossarms is the first important step.

SEASONING — Rainier air seasoned crossarms are also carefully seasoned by control of air circulation and by the location of seasoning sheds, as well as proper piling of the timber during the drying period.

KILN DRYING — Rainier kiln drying is superior because of scientific control during the seasoning period — correct temperature and the right humidity all the time while in the kiln means all fungus growth killed — timber seasoned throughout.

STOCKS — Graybar offers the careful buyer of crossarms an additional service — stocks at strategic locations. For planned-ahead buying or for emergencies, this fact is your assurance of lower shipping costs and quicker service.

Distributed by GraybaR ELECTRIC COMPANY

CONTACT YOUR NEAREST GRAYBAR OFFICE FOR PRICES

AMERICAN · CROSSARM AND CONDUIT COMPANY

GENERAL OFFICES
7726 SHERIDAN ROAD
CHICAGO 26

FACTORIES
KANSAS CITY, MO.
SCHILLER PARK, ILL.
MINNEAPOLIS, MINN.
DANVILLE, PA.
CHEHALIS, WASH.
GAINESVILLE, FLA.

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

Whatever you want in control cable—Anaconda has it!

PEAK RELIABILITY. Anaconda's Type ANW-rubber-insulated control cable is a high-quality product which features unusual heat resistance. It is also highly resistant to attack by moisture, acids, alkalies and other chemicals. Individual conductor covering and over-all jacket of neoprene.

MULTIPLE USE. Anaconda thermoplastic control cables can be installed aerially, in conduit, underground in ducts—or buried directly in the earth. They are available with either polyethylene (600 or 1000 volts) or Densheath* vinyl resin (600 volts) insulation and Densheath over-all jacket. Also with Densheath conductor covers on request.

OZONE-RESISTANCE. For station control applications where ozone conditions prevail, Anaconda offers a special low-voltage butyl-insulated cable. This control cable not only resists ozone, but individual conductor covering and over-all jacket of neoprene provide maximum insurance against moisture and mechanical injury.

SPACE-SAVER. You can install a 12-conductor cable in conduit now carrying a 6 or 7—with Anaconda Type PND† Control Cable. Individual conductor coverings of moisture-, oil- and gasoline-resistant nylon. Over-all Densheath jacket. Designed for general-purpose control requirements where space is a limiting factor.

Permanent Full Color Coding on rubber cables, by means of Anaconda's rubber-base coating, assures quick and positive circuit identification. Coding by surface printing, which conforms to IPCEA standards, also available. On thermoplastic cables, full color coding with pigmented insulation and surface printed coding are likewise offered. For information on any of Anaconda's Control Cables—including cables engineered for more specialized control requirements—see your Anaconda distributor or the Man from Anaconda. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U.S. Pat. Off. 87389
†Trademark

SEE THE MAN FROM ANACONDA®
FOR CONTROL CABLE

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

For Greater Safety and Savings On Every Overhead Job...

ALDEK Aluminum Industrial stepladders.

ALDEK Aluminum Industrial extension and single ladders.

ALDEK Aluminum Industrial platform ladders.

ALDEK

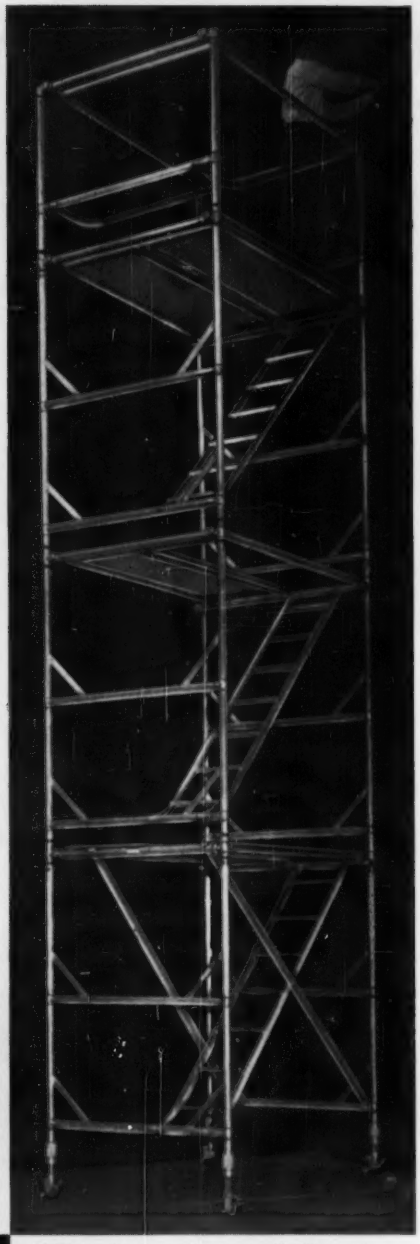
ALL-ALUMINUM SCAFFOLDS STAGES AND LADDERS

- **Lightweight, easy to handle**
- **Non-Sparking**
- **High-strength aircraft type aluminum construction**

ALDEK span, stairway and mobile bridge scaffolds are designed for fast, one-man assembly — feature instant action, positive locking, adjustable legs and ball bearing rubber tire locking casters.

ALL ALDEK PRODUCTS ARE APPROVED BY UNDERWRITERS LABORATORIES

ALDEK mobile bridge scaffolds give exceptional clearance... adjustable support poles provide a level working platform regardless of floor incline.



ALDEK stairway and span scaffolds require only one-man assembly—put workmen at the right level with ample room to move around.

Raise end frame 45°. Snap hooks over rail.

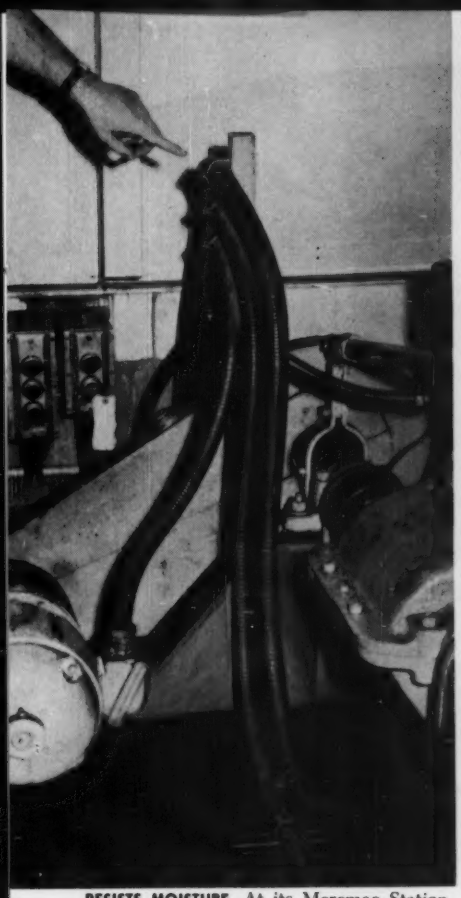
Move other end frame to vertical position. Snap on two diagonal braces.

ALUMINUM SAFETY PRODUCTS, Inc.

289 FIFTH AVENUE • NEW YORK 16, N. Y.

PLANT . . . TRANSFER, PA.

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR ELECTRIC COMPANY



RESISTS MOISTURE. At its Meremac Station, the Union Electric Company of St. Louis puts Sealtite to work in a real moisture spot—a sump pump.

RESISTS DIRT. Here's Sealtite working outside at Union Electric's Venice, Ill., plant. Sealtite is used to connect transformer and control to main switch room.

RESISTS OIL. Sealtite installed on a traveling screen drive at water intake of Meremac Station. Oil from gear housing and moisture from Mississippi River are hazards.

Sealtite flexible, liquid-tight conduit can "rough it" indoors or out!

At the Meremac Station of the Union Electric Company of St. Louis, Sealtite* was used because of its resistance to moisture, oil, and dirt. How has it worked out? Very well, even after 5 years of tough usage near pumps, controls and drives.

Sealtite has a tough, extruded polyvinyl jacket that delivers true wire protection under even the roughest conditions—conditions that would corrode most metal conduit. In addition, Sealtite is easier and less costly to install . . . especially in cramped spaces. It's ideal where conduit must flex or be moved, absorb vibration or join misaligned outlets.

WHERE TO GET SEALTITE — Electrical Wholesalers stock Types U.A. and E.F.† Sealtite in easy-to-handle coils, in black or gray. Be certain you ask for and get the quality conduit marked "Sealtite" on the cover. Buy it in long lengths on reels or in cartons and cut it on the job without waste. Your wholesaler also stocks liquid-tight connectors. Free Booklet S-538 gives full information on Sealtite. Write: The American Brass Company, American Metal Hose Division, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. Sealtite is approved by Canadian Standards Association.

*Reg. U.S. Pat. Off. †Pat. Applied For 87179GR

CUTAWAY SECTION of Type U.A. Sealtite shows tough polyvinyl jacket over flexible metal core. Copper conductor wound spirally inside conduit gives positive ground.

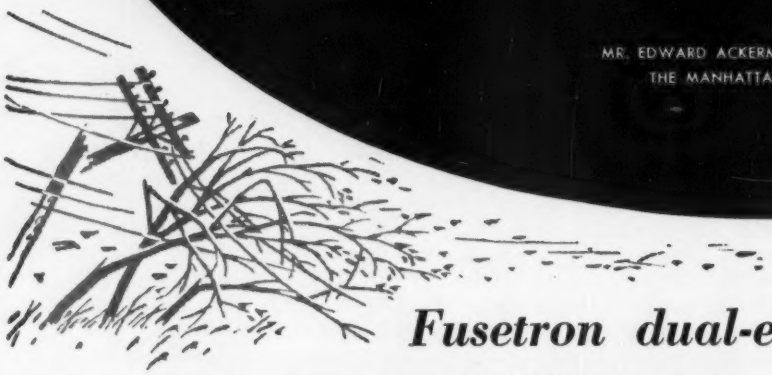
Insist on the conduit marked **SEALTITE**

FLEXIBLE, LIQUID-TIGHT CONDUIT

an **ANACONDA®** *product*

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR ELECTRIC COMPANY

MR. EDWARD ACKERMAN
THE MANHATTAN SHIRT CO.



Fusetron dual-element fuses protected 150 motors against burnout when a hurricane single phased our primary line

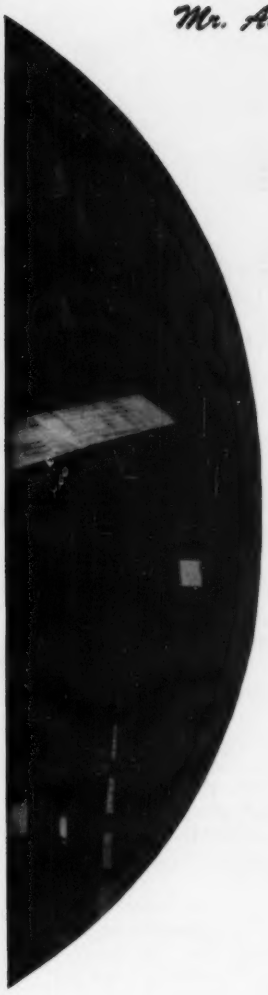
MR. EDWARD ACKERMAN
CHIEF ELECTRICIAN-THE MANHATTAN SHIRT CO.
PATERSON, NEW JERSEY

658

SAVE BY USING GraybaR FACILITIES FOR

Everything Electrical GraybaR ELECTRIC COMPANY

Mr. Ackerman continues . . .



"One afternoon a hurricane struck and single phased the line feeding our plant.

"At the time, all 150 of our sewing machines were in operation. No one suspected the motors were running single phase. Our first warning came when the machines started shutting down through the plant as Fusetron fuses began blowing to protect the motors.

"I had no idea in what condition we would find the motors. It was certainly a relief when we checked and did not find one damaged sewing machine motor. Around 300 Fusetron fuses had blown to protect them.

"You can imagine how costly it would have been to repair or replace these ½ hp., 3 phase, 220 volt motors — and our plant would have been out of business while this work was being done. So we think we paid a very small price when our only expense was replacing the 3-2/10 ampere Fusetron fuses.

"Since this experience, our seven other plants have been informed of the above incident, and it has been suggested to them, that they protect all sewing machine motors with Fusetron dual-element fuses."

Why Fusetron fuses provide safest, simplest way to prevent damage from single phasing.

When single phasing occurs, the current in the remaining phase increases about 100%. (Theoretically 73% but change in efficiency and power factor makes it about 100%.

This 100% overload on Fusetron fuses of motor-running protection size opens them and shuts down the motor.

Such dependable protection against motor burnouts from single phasing has never before been available.

You too, can get maximum electrical protection and save money by installing Fusetron dual-element fuses throughout the plant

With rare exceptions on commercial and industrial installations — ordinary fuses and circuit breakers protect only against short-circuits — but Fusetron dual-element fuses provide 10 point protection.

FOR LOADS ABOVE 600 AMPS. — USE BUSS HI-CAP FUSES TO COORDINATE YOUR ELECTRICAL CIRCUITS.

On 600 volts or less, BUSS Hi-Cap fuses have interrupting capacity sufficient to handle any fault current regardless of system growth.

They can be coordinated with Fusetron fuses on feeder and branch circuits to limit fault outages to circuits of origin.

FOR MORE INFORMATION ASK FOR BULLETIN FIS ON FUSETRON DUAL-ELEMENT FUSES — BULLETIN HCS ON BUSS HI-CAP FUSES.

BUSSMANN MFG. DIVISION
McGraw-Edison Co.
University at Jefferson, St. Louis 7, Mo.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

Play Safe! install FUSETRON dual-element FUSES and BUSS Hi-Cap FUSES throughout entire Electrical System!

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

"AMERICAN BRAND" Utility Ropes

IN NATURAL OR SYNTHETIC FIBERS

MANILA – Created especially for the utility field, "American Brand" and "AMCO All Weather" Pure Manila Ropes are used for hand lines, pole lines, guy ropes, hoisting and rigging. The special construction and exclusive lubricant reduces water absorption to a minimum and increases its resistance to weathering.

NYLON – About twice as strong as natural fiber rope, the initial cost is more because it will far outlast manila. Used for similar purposes as manila, its high strength permits the substitution of smaller and lighter ropes to accomplish the same job. Possessing high shock absorbency and high impact strength, nylon is unsurpassed as a safety line. In addition, it is easier to handle, impervious to rot, has greater flexibility and resists distortion and kinking.

Floterope® – The new high tenacity polyethylene rope being used for hand lines, hot lines, pulling lines, sagging lines, guy lines and catenary lines. Floterope is 60% stronger than manila (the ¼" size has a breaking strength of 1050 lbs.), is an excellent insulator and exhibits low dielectric loss. On some installations, insulators, special fittings and extra brackets have been eliminated; fewer poles and wider spans have been possible; ice build-up and lightning damage have been reduced.

IN ALL SI...
...¾" DIAME...
AND LARGE...
IN COILS O...
ON REELS

+GraybaR QUALITY SINCE 1869 *REG. U.S. PAT OFF Distributed by +GraybaR ELECTRIC COMPANY

With this combination of "American Brand" Ropes, you can reduce installation and maintenance costs, eliminate safety hazards and improve operating efficiencies.

AMCO

Western Mill

ST. LOUIS CORDAGE MILLS
Eleventh & Lafayette Streets • St. Louis 4, Mo.

AMERICAN
MANUFACTURING COMPANY, INC.
Noble & West Streets • Brooklyn 22, N. Y.

ROPE • TWINE • OAKUM • PACKING

Sales Offices: BOSTON CHICAGO HOUSTON NEW ORLEANS PHILADELPHIA SAN FRANCISCO

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

Give the Guy a CHANCE

When anchor users make a study of earth anchors—make their own pull tests for holding power—make their own comparisions... we're happy, because the Chance 8-Way almost always takes top position for holding power and ease of installation.

Such tests prove that the 8-Way holds far more than its rated load because its *eight* blades expand to form a complete pyramid shaped square—there is no wasted space between blades. The guy load is distributed to all *eight* blades all the way around the hole.

Chance 8-Way Anchors are available in sizes from 60 to 200 square inches in area, for distribution and transmission line guying. For the best in service on the best in line construction and maintenance materials, specify CHANCE from Graybar.

A·B·CHANCE CO· General Offices: Centralia, Mo.

(A·B· CHANCE CO· of Canada, Ltd., Toronto)

abc INDUSTRIES

and there are CHANCE ANCHORS for all soil and guying conditions

8-WAY EXPANDING
The 8-Way is usually installed in clay or loam. Available in sizes from 60 to 200 square inches in area, for distribution and transmission line guying.

NO-WRENCH SCREW
For hand or machine installation. Pitch-controlled blade goes down faster and adds to holding power in sandy soil, soft clay or loam.

SWAMP SCREW
For swamps, marshes, quicksand, river crossings or seasonally flooded areas. Screws down deeply by adding sections of pipe.

NEVER-CREEP
Reinforced structural steel. Pulls entirely against solid, undisturbed earth. For extra heavy loads in clay or loam.

CROSS-PLATE
For heavy-duty anchoring in machine bored holes. Holds better than logs or slugs. Saves time and money.

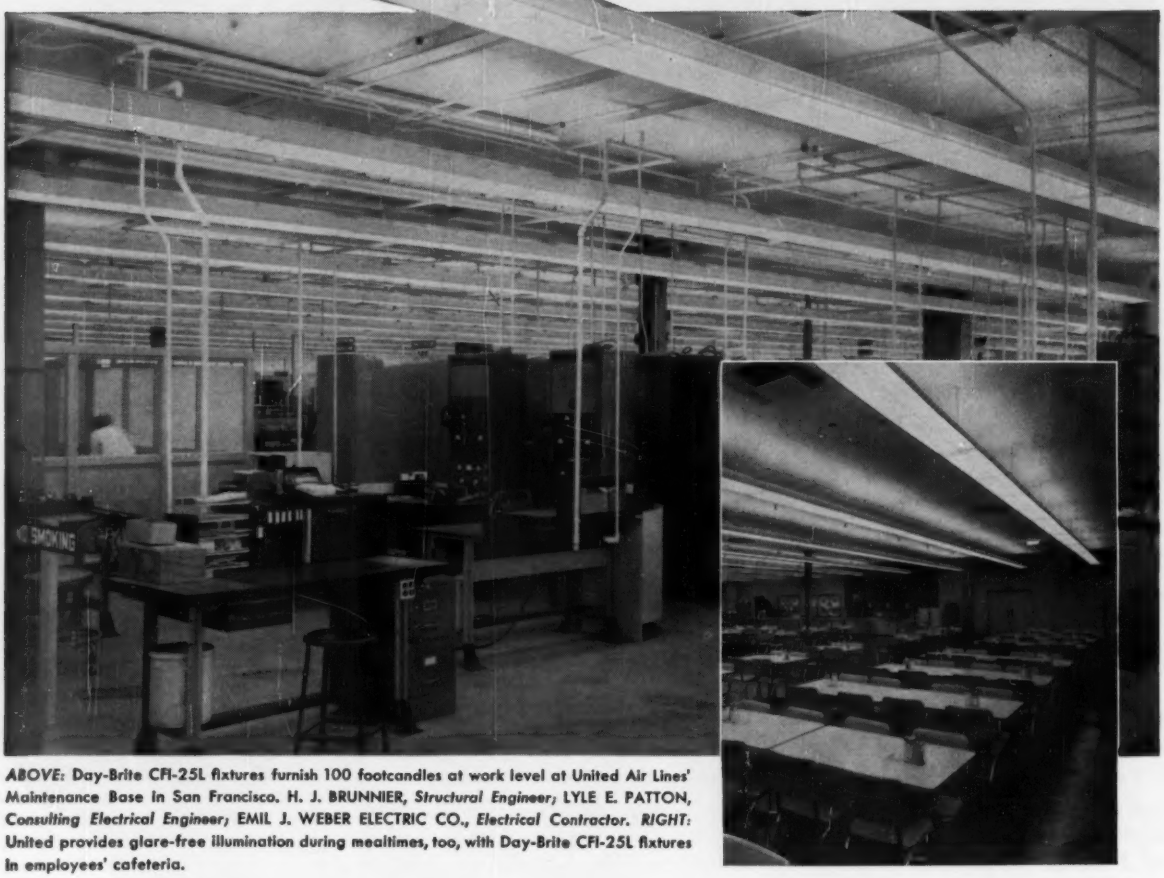
8-WAY CONE
Acts as inverted wedge. Flaring base and flat faces increase wedging action. Used in rocky areas with rock wedging.

EXPANDING ROCK
No grouting necessary. The greater the pull, the tighter it wedges against solid rock. Set in 2" drilled hole.

CA58-13

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical Graybar

Day-Brite CFI®
Industrial Fixtures



ABOVE: Day-Brite CFI-25L fixtures furnish 100 footcandles at work level at United Air Lines' Maintenance Base in San Francisco. H. J. BRUNNIER, *Structural Engineer;* LYLE E. PATTON, *Consulting Electrical Engineer;* EMIL J. WEBER ELECTRIC CO., *Electrical Contractor. RIGHT:* United provides glare-free illumination during mealtimes, too, with Day-Brite CFI-25L fixtures in employees' cafeteria.

...help stop troubles before they start

Periodic inspection of precision aircraft instruments allows no margin for error. High premium schedule, dependability and on-time performance require the finest lighting obtainable. That's why United Air Lines selected the high quality Day-Brite CFI (Comfort For Industry) fixtures for their San Francisco Maintenance Base.

Day-Brite fixtures are designed to eliminate installation problems. With exclusive, patented hanging devices that make alignment a "cinch." With machine tooled parts that fit snugly together... and factory pre-assembled to save time on the job.

Find out how Day-Brite design and quality can help you *make more money* by stopping troubles before they start! Call your Day-Brite representative listed in the Yellow Pages.

UNITED AIR LINES

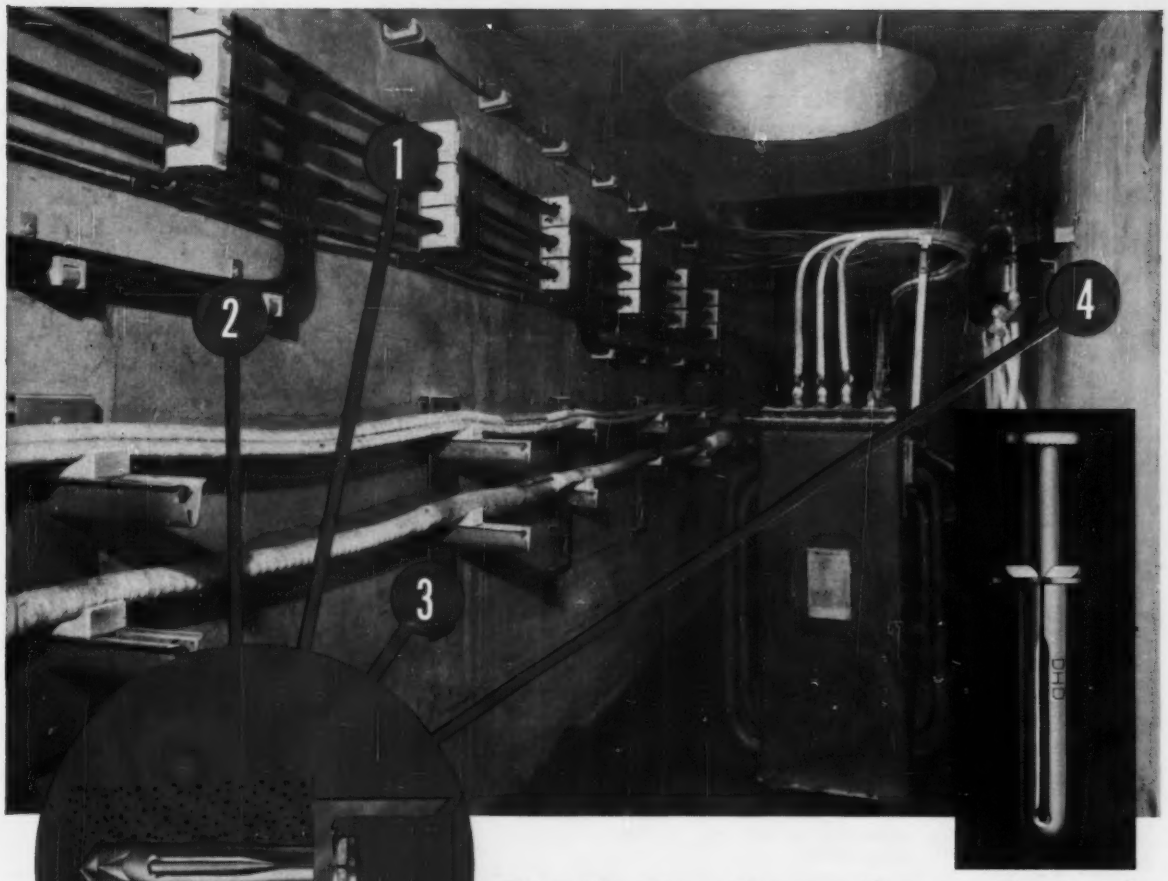
DECIDEDLY BETTER
DAY-BRITE
LIGHTING FIXTURES

Z-315

Day-Brite Lighting, Inc., 6270 N. Broadway, St. Louis 15, Mo.
Day-Brite Lighting, Inc., of Calif., 530 Martin Ave., Santa Clara, Calif.

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

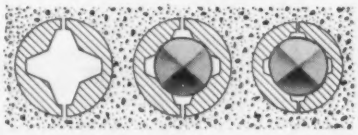
SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR



Distribution Nerve-Center Secured with DIAMOND "DHD®" Hammer Drive Anchors

This important underground transformer installation of a large eastern power company may be out of sight... but it's never out of mind as far as power engineers are concerned. They examined every component put into this installation for efficiency, long-term dependability and overall ability to do the best possible job, economically. They choose DIAMOND "DHD" Hammer Drive Anchors to secure (1) Secondary Bus Racks, (2) "L" Hangers, (3) Cable Stanchions, and (4) Oil Fuse Cutout Racks. In each case they chose "DHD" Anchors *to be sure it's secure!*

Specify *new design* DIAMOND "DHD" Hammer Drive Anchors for fast installation . . . greater holding power



Internal ribs in the aluminum Hammer Drive Expansion Shield allow it to adjust to off-size holes. Drill the hole, hammer home the nail and the "DHD" Anchor develops the greatest *sustained* holding power ever possible in a fastener of this type — regardless of variations in hole diameter.

For Heavy Duty Anchoring Jobs —

DIAMOND DOUBLE KEYSTONE SHIELD®

For over 50 years the Double Keystone Machine Bolt Shield has been specified by industry to secure heavy loads. Exclusive nutstop prevents overtightening and pullout. Shield expands parallel along entire length to accommodate variations in hole size.

Diamond makes a full line of Fasteners *for masonry and hollow walls,* Expansion Bolts *and* Shields, Masonry Drills, Conduit *and* Cable Straps *and* Clamps, *and* Pole Line Hardware.

DIAMOND EXPANSION BOLT CO., INC.

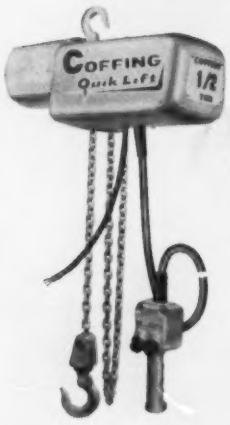
500 North Avenue · Garwood, New Jersey

Stocking Warehouses: Atlanta, Boston, Chicago, Dallas, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Seattle, St. Louis, Washington, D.C. Also, Montreal, Toronto and Vancouver, Canada.

1234

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical Graybar

Coffing Hoists for Safety and Economy



Coffing Quik-Lift Electric Hoists

New coil chain line features push-button controls on all models. Made with lightweight aluminum castings, they are available in 20 models ranging from ¼ to 2 tons in capacity. For other lifting speeds and larger capacities, we offer the Quik-Lift Series "S".

Super Power Coil Chain Hoists

Compound lever and ratchet-and-pawl construction make them lightest, safest, most efficient hoists in their class. Six models in capacities from 1½ to 5 tons—1½ and 3 ton in aluminum as well as malleable iron.

Safety Pull Roller Chain Hoists

Ratchet-and-pawl construction assures safe operation, and "Safety Valve" handle gives before any load-bearing part can fail—warning operator. Ten models in capacities from 1½ to 15 tons.

Challenger Spur Gear Hoists

Light-weight and dependable, the Challenger is available in ½ and one ton capacities. Durable construction and sealed-in lubrication reduce maintenance costs to a minimum.

Mighty-Midget Pullers

Light and compact—500 pound model weighs but 6½ pounds, 1000 pound model but 9½. Handle can be used either as a lever or a high speed crank.

Duff-Norton Jacks Save Time, Energy and Money

Pole-Pulling Jacks

Duff-Norton pole-pulling jacks will pull or straighten utility poles without laborious digging. Hinged channel base permits jack operation at an angle or upright as required. Service need not be interrupted when these jacks are used.

Cable Reel Jacks (single action)

Jacks are equipped with adjustable cable reel lift incorporating a steel hook which can be placed at any point on the lifting rack. Reels of different diameters can be picked up at any height. Five ton model 524MCR is especially adaptable to warehouse use for handling cable, wire, hemp rope, leather belting and the like.

DUFF-NORTON

Duff-Norton Company

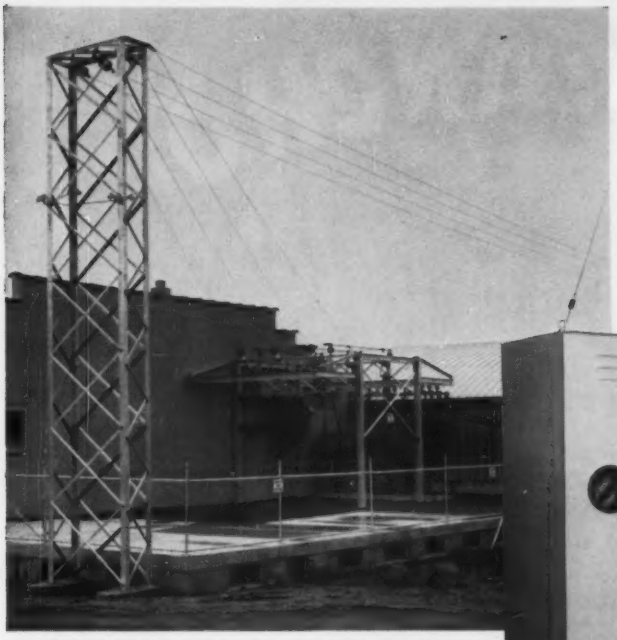
MAIN PLANT AND GENERAL OFFICES: PITTSBURGH 30, PA.

THE CANADIAN DUFF-NORTON COMPANY, LTD., TORONTO 6, ONT.

Coffing Hoist Division • DANVILLE, ILLINOIS

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

Outside or Inside



13.2 KV/240 volt transformer substation for Mayville Metal Products Company, Mayville, Wis.

Built by 3E for a large automobile plant, this switching center handles a 4800 volt input. Using Auto-Speed Load Interrupter switches, it distributes power to a 200 HP and two 300 HP motors used to drive high frequency generators.

See 3E...for safe, efficient high voltage equipment

SUBSTATIONS. 3E's complete service provides: *Engineers* who have built substations of all sizes and for all kinds of uses . . . specialists in circuitry, switchgear and structure. A wide variety of outdoor *switches* designed and built at 3E . . . we can recommend without partiality the exact type of switch you should have. *Fabrication facilities* that deliver a substation packaged for easy, erection.

SWITCHING CENTERS. Whatever your requirements —rigid space limitation, portable units, corrosive or dusty atmosphere, or a foresighted design that will meet tomorrow's expansion needs . . . 3E has the range of products and the designers to give you the ideal equipment for your plant.

Some typical 3E switches and auxiliary equipment....

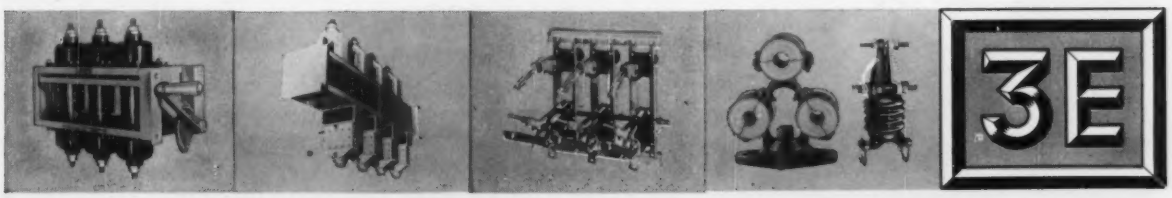
ISOLATORS
The famous straight-line-action switch. A 3E exclusive—takes only ⅓ the space needed by comparable knife type switches—rated to 15 KV in both disconnects and air interrupters.

ISO-DUCTS
A combination of compact modern ducts and ISOLATORS — ideal for future extension in either direction—any number of potheads and ISOLATORS can be combined and interchanged.

AIR INTERRUPTER SWITCHES
With safe Auto-Speed interruption — independent of operator speed. Arc is gas extinguished by dry-type interrupter on each pole — cost less than circuit breakers.

CLAMP INSULATORS AND BUS SUPPORTS
Wide range of sizes and types in rugged modern designs. Built of finest materials and designed for rapid safe installation. Prompt delivery from large stocks.

A REPUTATION
. . . for building equipment with an extra margin of safety. For almost 50 years the 3E name has meant conscientious engineering —safe construction.



ELECTRICAL ENGINEERS EQUIPMENT CO. Melrose Park, Illinois

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

EVERSTICK ANCHORS

FOR TOUGH ANCHORING JOBS!

Today's anchoring jobs bring Eversticks to the forefront. They provide tight, safe anchoring . . . always in excess of rated capacities. Easy and quick to install . . . made of finest grade maleable iron with superior rust-resisting qualities and exceptional toughness. Every Everstick is plainly marked for ease of handling and storing.

AN EXCLUSIVE EVERSTICK FEATURE

The nut housing feature of the Everstick prevents rod from slipping thru while installing and provides a solid substantial base for the expanding blades.

There's a complete line of Eversticks for all strain requirements. 15 sizes of 2-way—3-way—4-way types.

EVERSTICK ANCHOR CO., Fairfield, Iowa

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

GENERAL CABLE

the largest independent manufacturer of electrical

WIRES and CABLES

QUALITY PRODUCTS to cover every wire and cable requirement.

- BARE AND WEATHERPROOF
- BUILDING WIRES AND CABLES
  Rubber and Thermoplastic
- PORTABLE CORDS AND CABLES
- SERVICE CABLES
- POWER AND CONTROL CABLES
  Rubber and Thermoplastic
  Asbestos
  Varnished Cloth
- SAFETY MINERAL INSULATED WIRING SYSTEMS

for quality and service... specify GENERAL CABLE

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N.Y.

SAVE BY USING GraybaR FACILITIES FOR

AMAZON TAPE

Amazon A.S.T.M. tapes are designed for the severest kind of service — where top quality is of prime importance.

AMAZON FRICTION TAPE is of unusually high and uniform quality. Meets Government Specification HH-T-101 Grade A. The long fibers of the rubber compound used afford superior adhesion and make the tape an excellent insulator.

AMAZON RUBBER TAPE withstands a dielectric test of at least 350 volts per mil of thickness . . . meets Government Specification JJ-T-11C. The very high natural rubber content of this tape makes it extremely elastic and it is self-vulcanizing into a solid waterproof joint.

There's a Graybar tape
FOR EVERY JOB

Tapes for every electrical requirement are conveniently available from your nearby Graybar office or warehouse. Made to rigid Graybar specifications these fine tapes have a record of superior performance, long service, and outstanding value. For over forty years they have been the choice of industry and careful workers everywhere. Check the types shown on this page and see which are best suited to your own particular needs.

VICTOR TAPE

for general commercial use requiring a high grade tape

VICTOR FRICTION TAPE has a strong tacky friction, ages well and is virtually free from pinholes. Careful inspection assures a uniform quality.

VICTOR RUBBER TAPE is second in quality only to Amazon. It withstands dielectric test of 300 volts per mil of thickness — gives excellent service both indoors and out.

STICKA FRICTION TAPE

STICKA will be your choice for a hundred and one everyday jobs where a thoroughly reliable and economical tape is indicated. Order it by the 60 foot roll or in the convenient ten-roll shop package.

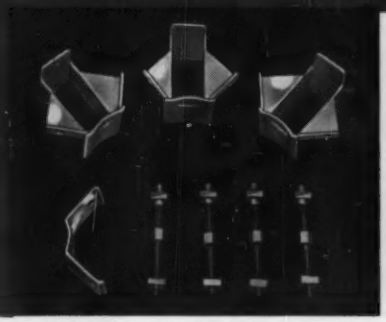
DEPEND ON ALL **Graybar** TAPES FOR THE BEST IN SERVICE AND VALUE!

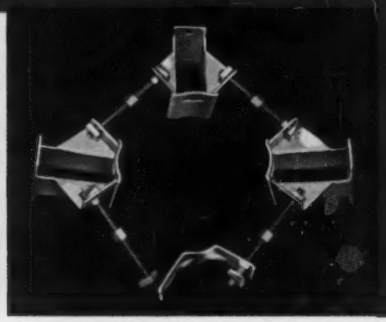
FREE! **SAMPLE TAPE ROLLS—Graybar will be glad to mail you sample rolls of Amazon Rubber Tape and Sticka Friction Tape. Each roll contains 30 feet of tape—enough for an on-the-job trial. Write for them today!**

SAVE BY USING GraybaR FACILITIES FOR

Now one transformer mount fits all poles 6½ to 16 inches in diameter!

New Hub Mount* takes all EEI-NEMA Transformers 3 kva to 167 kva in one, two, three combinations

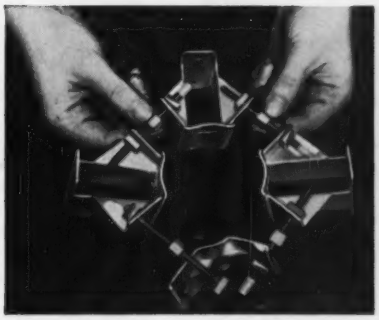




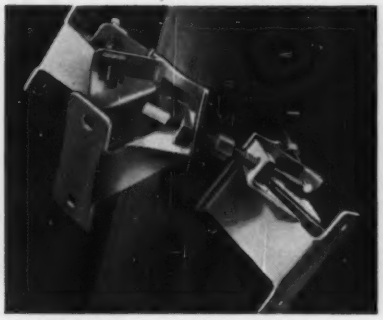
Working scale model demonstrates ease of assembly!

1. HUB-MOUNT assembly is made up of 1, 2 or 3 mounting boxes and quarter plates plus 4 turnbuckle-type bolts. Connecting bolts are fabricated from Cor-Ten steel for long service life. In tests, Hub-Mount has supported more than three times the weight of three 167 kva transformers without any visible deformation!

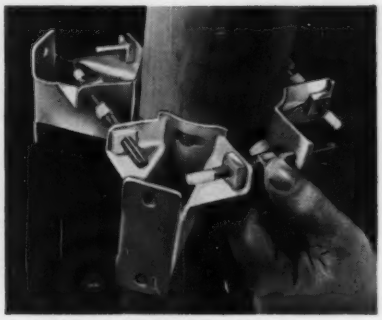
2. GROUND ASSEMBLY. With so few parts, assembly is simple, trouble-free. Left hand bolt threads and nuts are color-coded to speed assembly by eliminating trial and error. Hub-Mount's all steel design eliminates carpentry, periodic maintenance present in platform construction.



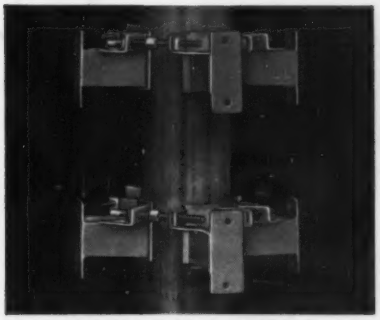
3. GROUND ADJUSTMENT. Turning downward on hex section of turnbuckle bolts adjusts size of Hub-Mount to pole diameter at the point of installation. Hub-Mount has only four points of adjustment. By adjusting three of them on the ground, it is only necessary for the lineman to wrench at one point on the pole.



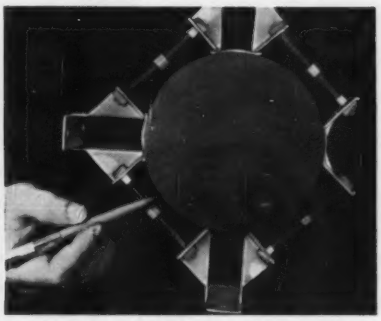
4. MOUNTING. Hub-Mount is lofted to the pole, hung from one lag screw driven into the pole at the desired height. This leaves the lineman entirely free to complete the installation, by connecting open turnbuckle bolt to quarter plate. Lineman makes his installation from one point on the pole!



5. FINAL ADJUSTMENT. Wrenching downward on the hex section completes installation. When installed, Hub-Mounts work in compression, are not loosened by pole shrinkage. The weight of the transformers causes the Hub-Mount to bind on the pole, thereby maintaining a tight grip.



6. READY FOR TRANSFORMERS. This simple, flexible arrangement accommodates all EEI-NEMA transformers from 3 kva to 167 kva in combinations of one, two or three. Hub-Mount's exclusive design places no reliance on welds, which work in compression, do not govern available strength.



7. WRENCH CLEARANCE. Note wrench clearance at maximum adjustment on 16 inch pole diameter.

*Patent Pending

HUBBARD
AND COMPANY

Pittsburgh 1, Pa.
Chicago, Ill.
Oakland, Calif.
Plano, Texas

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

NOW···GLOBE OFFERS···
two new INTERCHANGEABLE trays for support of cables, wiring and tubing

★ Engineered for uniform design and easy installation
★ Steel or aluminum construction
★ Complete accessories for SPEEDIER Installation
★ No sharp edges to damage cables
★ Complete interchangeability

Now, for the first time, two types of cable trays, one a ladder type and the other a basket type, are available to be used INTERCHANGEABLY at any given location, depending on the type and weight of the cables to be suspended. The advantages of each type tray can thus be used to the fullest extent. Globetray, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is intended for the support of communication wire, instrument tubing and control cables in automation applications.

These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants, in modernization, and for power distribution in all types of manufacturing processes. A new catalog, just off the press, gives full information and installation techniques. Ask for your FREE copy today.

Distributors are to be found in all principal cities— consult the yellow pages in your phone book under "Gratings" or "Conduits" for the one nearest you.

109

PRODUCTS DIVISION

The **GLOBE** *Company* MANUFACTURERS SINCE 1914

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Twist-Lock

A twist of the cap and it locks!

REGULAR

7311
3-wire Armored Cap

20 amps., 250 V. A.C. or D.C.
10 amps., 600 V. A.C.

7313
3-wire Connector Body

"INSULPRENE"

9770
2-wire Cap

20 amps., 250 V. A.C. or D.C.

Resistant to oil, water or impact

9768
2-wire Connector Body

GROUNDING

4700
Duplex Receptacle

15 amps., 125 volts

For grounding purposes only

4720
3-wire Rubber Cap

SUPER

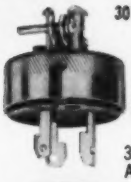
3221
2-wire Armored Cap

20 amps., 250 volts

Screwless terminals and dead front

3223
2-wire Connector Body

30 AMP. SUPER



3331
3-wire Armored Cap

30 amps., 250 V. A.C. or D.C.

3333
3-wire Connector Body

MIDGET

7464
2-wire Connector Body

7465
2-wire Cap

10 amps., 250 volts
15 amps., 125 volts

7466
2-wire Male Flush Base

It Pays To Have Good Connections

For over 70 years, Hubbell specification grade wiring devices have been recognized for their dependability, trouble-free operation and quality appearance. And there are other reasons, too, why it is good business to specify Hubbell. For example:

Hubbell devices incorporate carefully engineered installation advantages which save you time, trouble and expense.

Hubbell devices are always readily available—sold exclusively through authorized electrical distributors who are supplied from strategically located warehouses throughout the country.

Hubbell devices are nationally advertised and merchandised to support your selling efforts.

Hubbell devices are backed by field engineering to assist you in any phase of your electrical installation.

The products shown are representative of Hubbell's complete line of quality wiring devices. For full information, write Harvey Hubbell, Inc., Bridgeport, Conn., or contact your local Graybar distributor.

Hubbellock®

Heavy-duty, dust-tight, locking connectors

30 amps., 600 V. A.C.
20 amps., 250 V. D.C.

20403
4-wire Receptacle with 20416 lift cover plate

20415
4-wire Male Cap

30 amps., 600 V. A.C.
20 amps., 250 V. D.C.

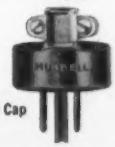
20414
4-wire Connector Body

GROUNDING DEVICES

5262
Duplex Receptacle

15 amps., 125 volts

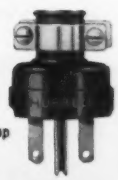
For grounding portable elec. equip.



5264
Armored Cap

5661
Single Receptacle

15 amps., 250 volts



5676
Rubber Cap

A.C. SWITCHES

Withstand Inductive Fluorescent Loads

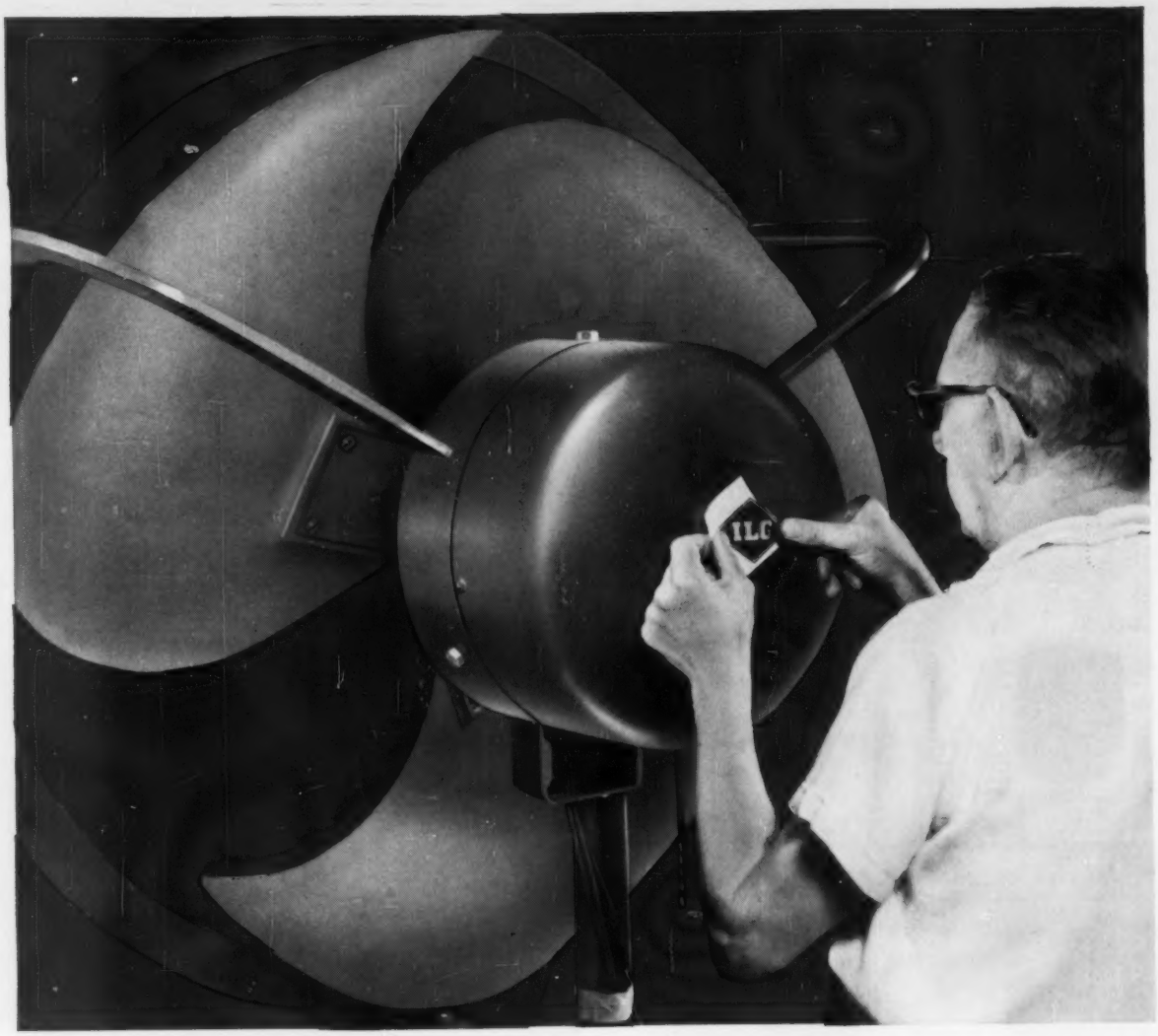
15 amps.
120-277 volts

Topper **1201**
Single Pole A.C. Toggle Switch

15 amps.
120-277 volts

presSwitch **1251-I**
Single Pole press-action A.C. Switch

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical Graybar



at his finger tips (and yours)...

this guarantee of trouble-free performance

Put in ILG Propeller Fans — with this "One-Name-Plate" guarantee—and you get performance that pays off at all levels.

Maintenance, for example, is no problem. Ilg-built self-cooled, permanently lubricated motors never run hot, have no internal starting switch to wear out, last longer.

Operating Costs? Low. Ilg self-cooled motors offer the cost advantages of open-type motors . . . protection superior to totally enclosed motors . . . *save as much as 10% on power costs.*

Quiet Operation? Right! Direct-connected Ilg fans eliminate noise, slippage and friction of belts and pulleys. Patented-design, dynamically balanced fan wheels cut vibration and noise to the minimum.

And should you need any further service once an Ilg fan is in, you merely call your nearest Ilg office. One call brings prompt action . . . puts real meaning into our "One-Name-Plate" pledge of superior performance.

ILG

ILG ELECTRIC VENTILATING CO.
2885 N. Pulaski Road, Chicago 41, Ill.
Offices in 57 Principal Cities

SAVE BY USING GraybaR FACILITIES FOR

Everything Electrical GraybaR

IT'S PERFORMANCE THAT COUNTS
One piece of galvanized steel strand may look much like any other BUT there can be a marked difference in performance.
That is why it is so important where overall construction costs are high (compared with the cost of the strand itself) to obtain the best strand available for a specific job.
More than 50 years of specialized skill and experience go into every coil and reel of Crapo Galvanized Steel Strand. Each size and grade is produced from selected steel, processed under laboratory supervision and galvanized by the dependable Crapo Process to meet the demands of the service for which it is intended.
Both individual wires and finished strand undergo rigid laboratory tests to make certain that the final product conforms to highest standards and specifications.
Thus you can be sure, when you specify Crapo Galvanized Steel Strand for guys, messenger or overhead ground wire, that you are getting a consistently high quality product which will give you the utmost in performance.
Crapo
GALVANIZED
STEEL
STRAND
SPECIALIZING IN STRAND FOR THE UTILITIES . . .
Our engineering, manufacturing and testing facilities are geared to the production of quality steel strand for the power and communication industries. If you have a problem involving the use of steel strand in overhead lines, ask your Graybar representative for pertinent technical information!
INDIANA STEEL & WIRE CO.
Muncie, Indiana
Crapo Galvanized Steel Strand is available in all standard sizes and grades and in Class A, B and C Coatings.

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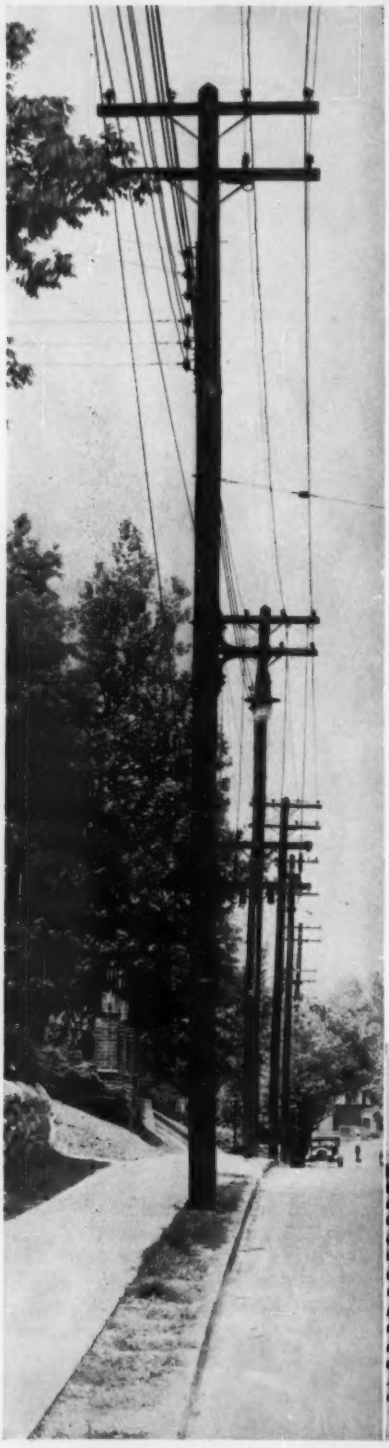
Everything Electrical
GraybaR

DEPENDABLE



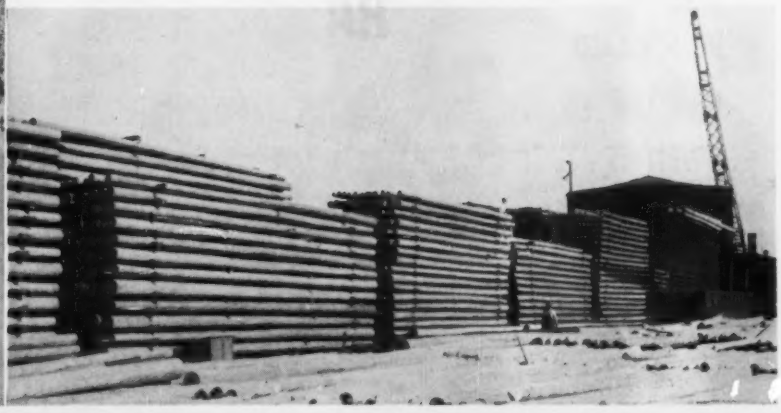
Poles

of Selected Sound Timber Scientifically Treated

THE lasting strength of International Creosoted Pine Poles plus their low ultimate cost makes them the safest and most economical poles that can be purchased. For more than 83 years, numerous service records of pole treatments have been utilized to perfect the present production practices for International Creosoted Poles. As a result of the lessons learned during this long experience, International Creosoted Poles will assure trouble-free, continuous service. Their straight, clean, smooth surfaces perfectly adapt them for street lighting, rural and urban distribution.

International Creosoted Pine Poles are manufactured and distributed by two of the oldest companies serving the utility industry. They have grown up together, ready always to serve with quality poles, framed correctly, and shipped when needed.

GraybaR Distributed by GraybaR Electric Company



INTERNATIONAL CREOSOTING & CONSTRUCTION CO.

PRODUCERS OF HIGH GRADE TREATED TIES, POLES, PILES, ETC.

Galveston — Beaumont — Texarkana

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IF IT CARRIES CURRENT,
K/W CARRIES IT!
SERVICE ENTRANCE CABLE
UL-approved Kaiser Aluminum Service Entrance Cable is available for 75° wet applications! Improved design characteristics – including pleasing appearance and ease of application – make this cable your best buy.
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KAISER ALUMINUM
CONTACT YOUR NEAREST GRAYBAR BRANCH TODAY!

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BUILT TO LAST

THE LIFE OF THE EQUIPMENT IT SERVES

MERCOID SERIES "D"

PRESSURE — TEMPERATURE CONTROLS

PLUS

These approvals and listings

GENERAL PURPOSE

NEMA 1. For indoor service and other general purpose applications where atmospheric conditions are normal. This type of construction serves as a protection against dust, and light indirect splashing.

U/L Types, DA, DR, DS,
CSA.

WEATHER RESISTANT

NEMA 1A, 2, 3, 4: For outdoor service and other applications. This type of construction is semi-dust tight; drip tight; weather resistant (weather proof, splash proof, sleet proof, moisture resistant, rain tight) water tight (hose test).

U/L
CSA Type DAW
FM

EXPLOSION PROOF

Class 1 Group C and D (NEMA 7): Atmospheres containing gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvents, vapors and natural gas. Class 2 Group E, F, and G (NEMA 9, 9A): For atmospheres containing metal dust, carbon black, coal or coke dust and grain dust.

U/L Types DAE, DRE,
CSA

Bourdon Tube Power Element—Outside Adjustments (No Tools Required)—Visible Settings Over Calibrated Dial—Visible "On-Off" Sealed Mercury Contact—A Wide Selection Of Operating Ranges With Varying Differentials.

WRITE FOR CATALOG NO. 858

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205 E. 42nd St., New York · 3137 N. Broad St. Philadelphia

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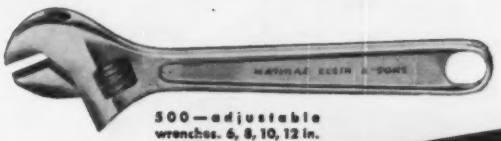
201—famous Klein Side Cutting Plier. Sizes 5, 6, 7, 8 and 9 in.

201-NE—rounded nose side cutting plier. Sizes 5, 6, 7, 8 and 9 in.

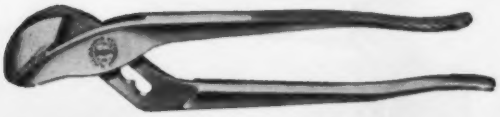
213-9NE—high leverage plier. Will cut regular and weatherproof hard drawn copper wire up to No. 2.

301—long nose plier. Available in 5-, 6- and 7-in. sizes. Also may be had with cutters.

202—narrow nose oblique cutting plier. Available in 5- and 6-in. sizes.



500—adjustable wrenches. 6, 8, 10, 12 in.



510—pump plier. One hand operation. Length, 9½ in.

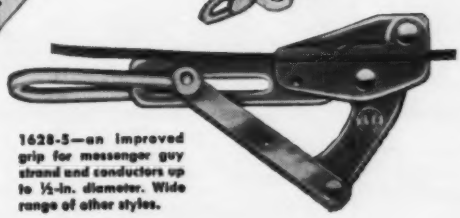
KLEIN TOOLS EST. 1857

a century of progress

Klein has been the leading supplier of tools and equipment to the electrical industry since the first wires were strung. It was over 100 years ago that Mathias Klein first opened his little forge shop in Chicago. Today the name Klein is known for quality the world over. From **Graybar Electric Company Inc.** you can secure anything you need in tools and equipment for linemen and electricians. Shown here are a few of the popular Klein items available.

5249—linemen's belt. Full floating with "Klein-Kord" sliding trace. One of a complete line.

1945-A—climbers, right and left, adjustable from 15 to 18 in. One of a complete line.



1628-5—an improved grip for messenger guy strand and conductors up to ½-in. diameter. Wide range of other styles.

5294—"Klein-Kord" nylon safety strap made of multiple plies of strong, woven nylon bonded with frictioning and vulcanized in neoprene.

This new Klein Catalog is just off the press. A copy will be sent to anyone interested on request.

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

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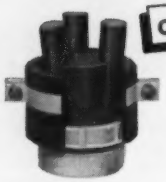
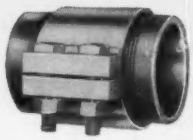
CABLE SUPPORTS
CONDUIT TYPE

CONDUIT FITTINGS



CABLE SUPPORTS
SPLIT TYPE



SPLIT
COUPLINGS

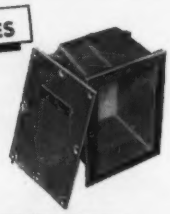
EXPANSION
FITTINGS

INSULATED
BUSHINGS

BAKELITE
BUSHINGS

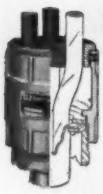
CAST IRON BOXES

EXPLOSION-PROOF
TYPE

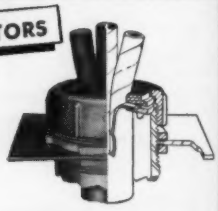


WEATHERTIGHT
SUBMERSIBLE TYPE

CABLE TERMINATORS

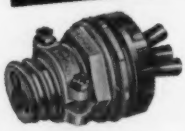


TERMINATING
POTHEADS



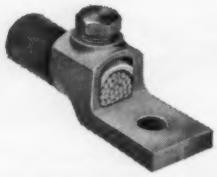
SEALING
BUSHINGS

INTERLOCKED ARMOR CABLE FITTINGS



TERMINATORS

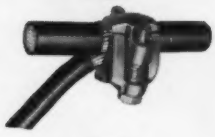
SPLICING
FITTINGS



COMBINATION
LUGS

SOLDERLESS CONNECTORS

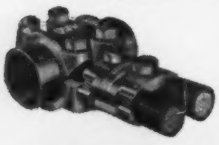
COMBINATION
TWO-WAY
CONNECTORS



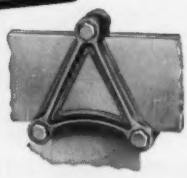
SERVICE
TAP

COMBINATION
TEE AND
PARALLEL CONNECTORS

POWER CONNECTORS

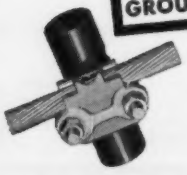


T-CONNECTORS, TUBE
TO MULTIPLE CABLE TYPE



BUS BAR
CLAMPS

GROUND CONNECTORS



CABLE TO PIPE OR ROD
90° OR PARALLEL

CABLE TO
FLAT BAR

They're O. K. if They're O. Z.

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It Pays to have the Right Equipment

Distributed by GraybaR ELECTRIC COMPANY

TAKE-UP

Combination Pay-Out and Take-Up Reel with . . . Automatic Brake

PAY-OUT

OSHKOSH

POLE LINE TOOLS

LEACH COMPANY • OSHKOSH, WISCONSIN

Since 1857

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

ALL NEW FOR '58

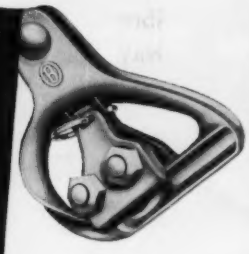
Additions to O-B Line of Distribution Materials Offer Even Broader Selection, More Efficient Installation . . .

Look what's been added to the Ohio Brass lineup of distribution materials—a lineup already the largest in the industry. Whatever your installation problem, there are O-B insulators or hardware to solve it. Moreover, you have a wide choice of materials—aluminum, malleable iron, bronze. For deadends you can choose from three different styles—Universal, Strateline and quadrant. And there are variations in material and design for each style.

Here are the newest items, all quickly available through Graybar:

COOLINE LW QUADRANT CLAMP
A low-cost aluminum clamp designed for economical installations where stringing tensions are low and heavy-duty clamps are not needed.

SLIM STRATELINE CLAMP
Ideal for close phase-to-phase spacing. Easy to work "hot" since rubber goods can be applied quickly.



88500 UNIVERSAL CLAMP
Has a spring that holds keeper piece open during installation, in effect, giving the lineman an "extra hand" to work with.

DISTRIBUTION POST
Another low budget item . . . designed for installations where 1500 pounds cantilever strength is adequate.

Ohio Brass

Distributed by GraybaR ELECTRIC COMPANY

4880-H

OHIO BRASS COMPANY • MANSFIELD, OHIO

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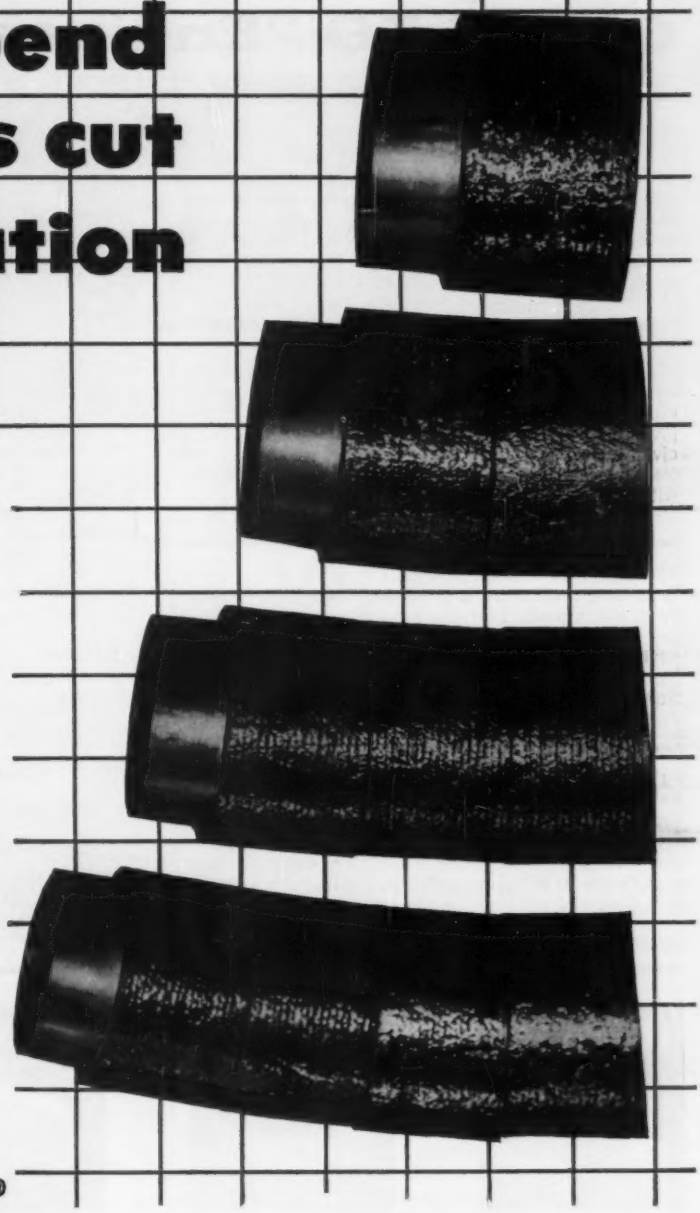
These bend sections cut installation costs



Orangeburg 5° Bend Sections are the "on-the-job" answer to special bend problems. They get over, under or around those unforeseen obstructions . . . and do it easily and economically.

Crossovers . . . transformations . . . offsets . . . can be made in the field by joining sections together to obtain the desired direction change. No costly delays . . . no special bends needed.

Orangeburg 5° Bend Sections* are another reason why Orangeburg Fibre Conduit is the ideal protective raceway for underground electrical cables.

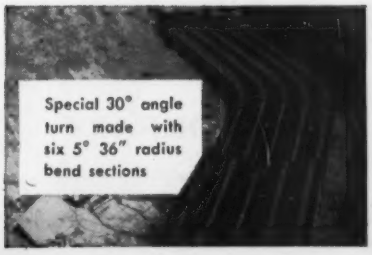
For complete information write Dept. EW-68 for Bulletin S.E.C.

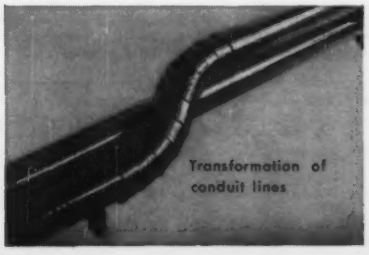
**Made for Orangeburg Standard Conduit only.*

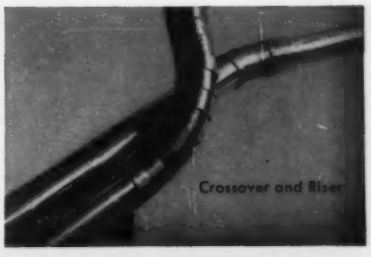
ORANGEBURG MANUFACTURING CO., INC.
Orangeburg, N. Y. Newark, Calif.

ORANGEBURG®

FIBRE CONDUIT PROLONGS CABLE LIFE







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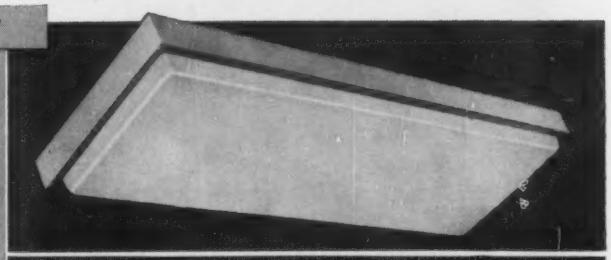
PITTSBURGH'S

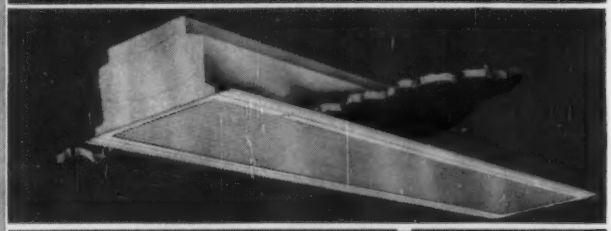
GUIDE TO "Engineered Lighting"

FLUORESCENT

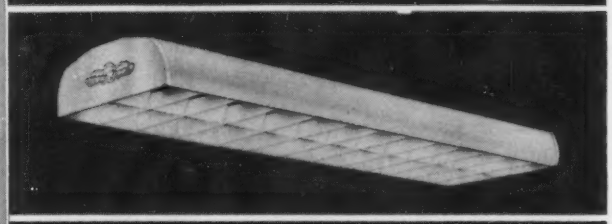
PITTSBURGH'S Modular Line. These new dimensionally accurate fluorescent modular units come in squares or rectangles for shallow or recessed mounting. Modular construction permits quick and simple installation on in-line, square or pattern designs. Attractive styling makes units ideal for modern buildings. Sturdy construction assures long life.



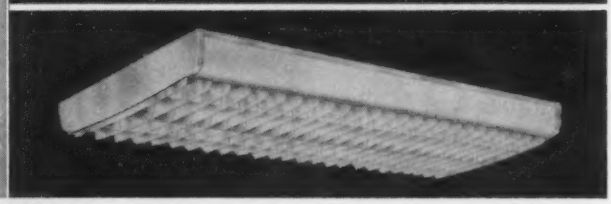
PITTSBURGH'S Recessed Troffer. The Pittsburgh Troffer is installed into the ceiling and provides efficient illumination that is inconspicuous and highly pleasing. It's ideal for commercial, institutional and civic buildings where the ultimate in architectural treatment is desired. Each troffer section is complete with ends welded on.



PITTSBURGH'S See-Way. This popular luminaire is 86% light efficient! It gives glare-free, comfortable light, that's perfect for classrooms and offices. Flexible Ribbed Polystyrene side panels snap into position, saving considerable man hours of installation time. Various shielding combinations are available for See-Way and the Norwin, a low "first cost" companion unit with steel sides.



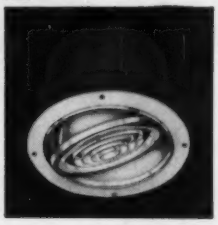
PITTSBURGH'S Garfield. The GARFIELD luminaire is a unit of unmatched beauty. It is only 3⅞ inches deep, which results in a surface-mounting unit that achieves a "built-in" effect even when the GARFIELD is mounted on very low ceilings. Side panels are of diffusing polystyrene, louvers of 35° x 35°, finish of synthetic white enamel. A companion unit, The Arthur, is available for pendant mounting.



INCANDESCENT

No. E-230 PERMAFLECTOR
Illustration shows one of a complete line of symmetric reflectors. The E-230 is a medium distribution unit for any location with low ceiling heights. Ideal for interior lighting of stores, or for any commercial use. Available in a complete line for recessed or pendant mounting.

No. 55 PERMAFLECTOR
Typical unit of a complete line of asymmetric reflectors. Designed for shallow windows, medium trim and island windows. Often used for interior lighting of wall displays, building entrances and fronts, church interiors, display cases, indirect cove lighting.



DLC-SERIES DOWNLIGHTS
These recessed adjustable downlights are perfect for spotlighting floor displays, charts, counters. They utilize high efficiency silver-mirrored PERMAFLECTORS. Units rotate in complete circle and fix in any position up to 30° from vertical axis. Concentric louvers shield light source.

THOUSANDS of outstanding lighting installations throughout the United States are practical examples of the confidence placed in Pittsburgh Reflector Company products. We will welcome the opportunity to demonstrate how a PITTSBURGH "Engineered Lighting" installation can fit into your plans and your budget.

PITTSBURGH REFLECTOR COMPANY
40b OLIVER BUILDING, PITTSBURGH 22, PA.
Permaflector Lighting Engineers in All Principal Cities

IN CANADA: Pittsburgh Reflector of Canada, Ltd., 105 Tycos Drive, Toronto, Ontario

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never before!

COMPACT, LOW-WEIGHT CONNECTORS WITH HIGH CURRENT RUPTURING RATINGS*

The new industrial series "C" Pyle-Star-Line connectors combine unique insulation and construction characteristics which make possible extraordinarily high circuit breaking ratings for the size and weight of the shell.

"Sandwich Insulation"—a resilient silicone insulation disc which floats between two rigid discs absorbs shock and vibration and permits the contacts to align themselves. The silicone, under pressure, reacts like a fluid. It flows into all crevices about the contact pins and sockets—positively prevents moisture or dust from passing through the insulation or accumulating to cause failures from short circuits or grounds.

Contact Inserts

Tough Anodic Coating of shell provides a smooth, attractive finish which has a hardness equal to 40 on the Rockwell C scale.

Rugged, Compact, Low-Weight Shell machined from high tensile strength aluminum...combined with the unique insulation features...provide a safe reliable, easy-to-handle connector which is highly resistant to the most punishing extremes of temperature, pressure, shock, vibration, corrosive dusts and moisture. Advantages never before combined in a single, standardized connector!

***Listed by Underwriters' Laboratories** in circuit breaking ratings of 30, 60, 100 and 200 ampere, 600 volt, A.C.

Write for 64-page catalog, No. 1252-I

THE PYLE-NATIONAL COMPANY

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CONDUIT FITTINGS • PLUGS AND RECEPTACLES • LIGHTING FIXTURES • FLOODLIGHTS

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RAY-O-VAC® HEAVY-DUTY

Industrial Flashlights and Batteries

"WORKMAN"
No. N22—2-cell
No. N32—3-cell
Shortproof industrial flashlight

The Ray-O-Vac line of heavy-duty industrial flashlights and batteries has been specifically designed to meet the most rugged demands of modern industry. Always look to Ray-O-Vac to meet the needs for portable light.

ORDER TODAY FROM
YOUR NEARBY GRAYBAR BRANCH

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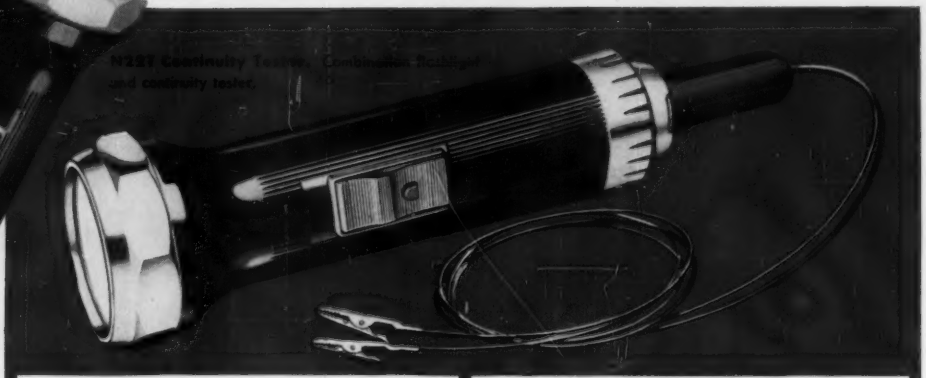
Division Offices: 212 East Washington Ave., Madison 10, Wisconsin. 1388 Madison Avenue, Memphis 4, Tennessee. 461 Market Street, San Francisco 5, California. 1775 Broadway, New York 19, New York. Ray-O-Vac Canada, Ltd., Winnipeg.



941 Lantern Battery...Raysol additive extends shelf life; assures user of longer, more dependable battery service. Protects against leakage.

3LP Industrial Leak Proof Battery. Sealed-in-steel. Gives longer usable bright light. Guaranteed against corrosion damage to flashlights.

N22W8
"WORKMAN" flashlight
with signal wand.

new RAYSOL added!

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

LET US PROVE WE HAVE A BETTER ~~MOUSETRAP~~ Distribution Clamp

NEW Extruded Aluminum Clamps For Copper and Aluminum Conductors

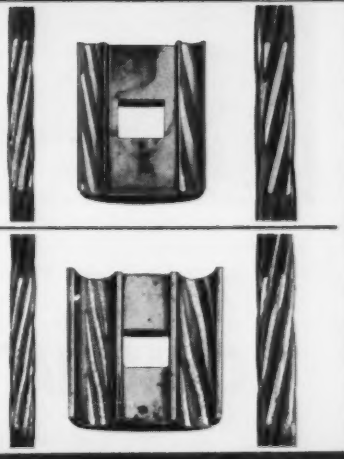
- SINGLE BOLT CONNECTION
- NO COPPER LINERS
- CAPTIVE PARTS
- EASY INSTALLATION
- EXCELLENT CONDUCTIVITY
- LONG SERVICE LIFE
- AVAILABLE WITH NO-MELT INHIBITOR

Extensive tests uphold the design of these Reliable Clamps — the use of extruded shapes, the mass anode principle and a single hex-head bolt. There is plenty of metal with lots of space between conductors. Clamps are tightened with wrench against wrench.

STRAND CONTACT

Picture shows strand contact area in the Reliable Distribution Clamp. Tightened to normal torque, every one of the six outer conductor strands has adequate contact area at sufficient pressure to maintain current carrying ability even for overload and fault current conditions. Strands were treated so contacts would show.

Available in three sizes for conductors 6 to 1/0, 2 to 4/0 and 1/0 to 336.4



Write for supporting data and sample clamp to suit your conductor.

A HALF CENTURY OF SERVICE TO THE UTILITIES

Reliable ELECTRIC COMPANY • FRANKLIN PARK, ILL.

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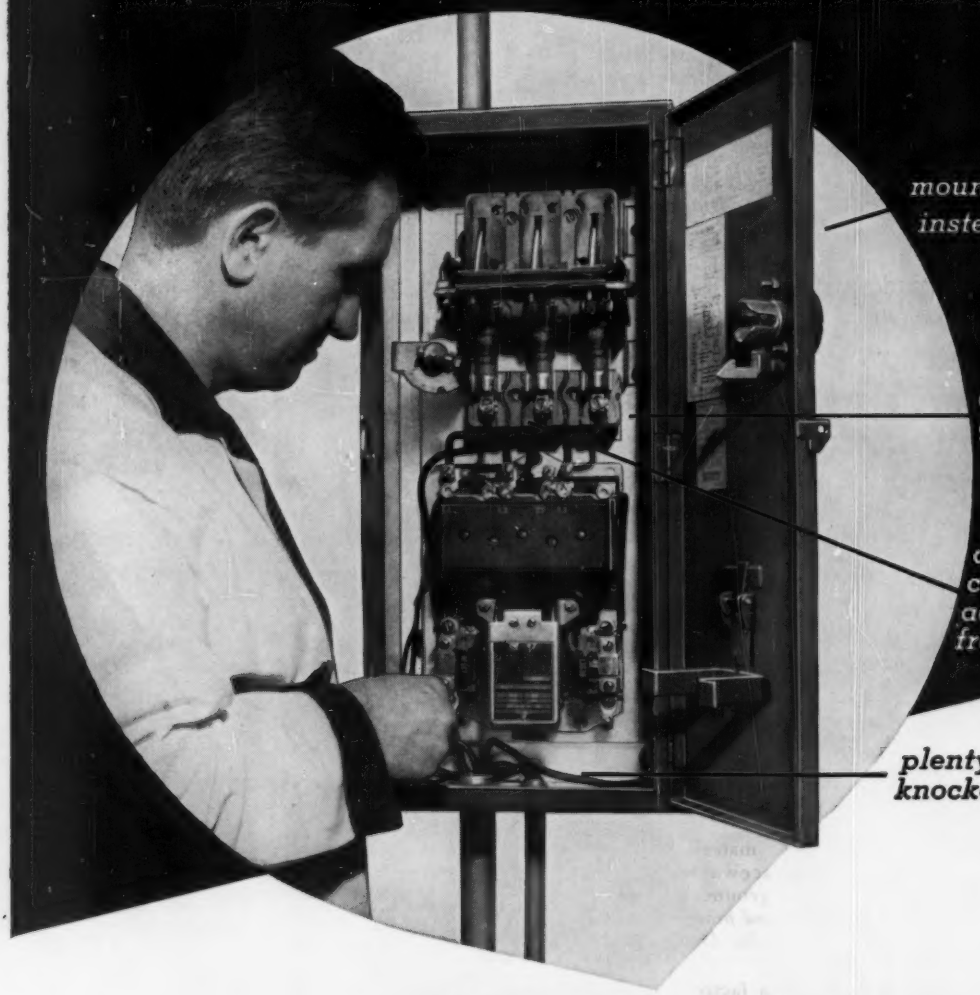
EASIER TO INSTALL AND MAINTAIN!



SQUARE D COMBINATION STARTERS

(Switch or Circuit Breaker Types)

Save space and time. Mount and wire one device instead of two . . . neater, more attractive installations.

COMBINATION STARTERS and other Square D Products are distributed by GRAYBAR

SQUARE D COMPANY

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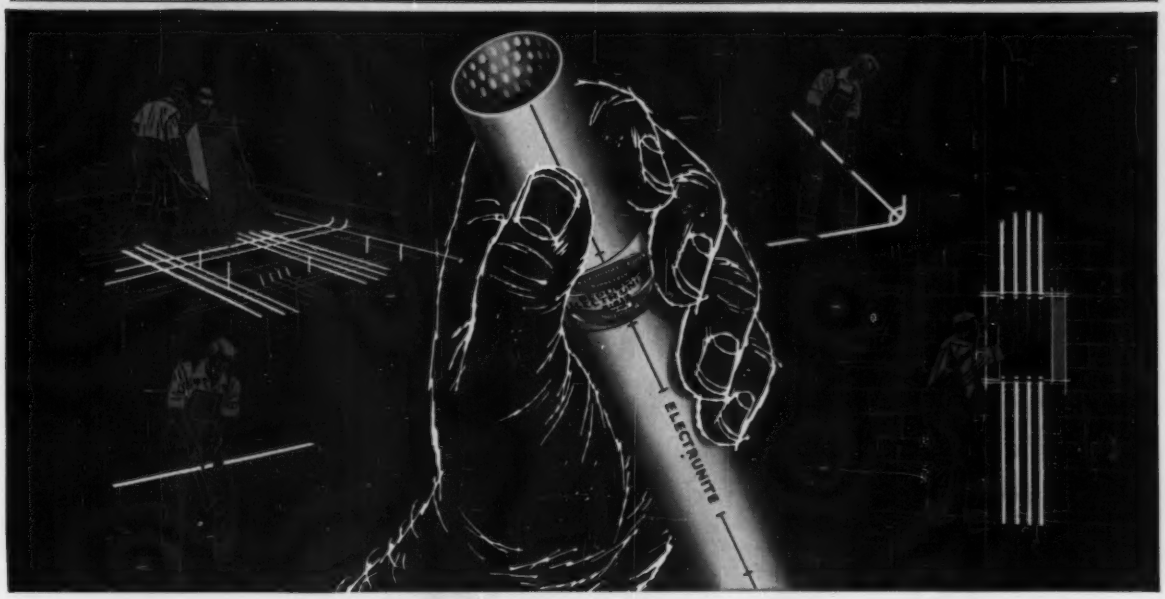
THE BEST COSTS LESS INSTALLED



plan for tomorrow... build-in for tomorrow with Republic ELECTRUNITE ELECTRICAL METALLIC TUBING

ELECTRUNITE sets the pace for installing tomorrow's load-building capacities economically. More power today to produce more goods, services, and conveniences tomorrow requires built-in electrical conduit capacity to meet ever-increasing demands.

Republic ELECTRUNITE® E.M.T. offers material cost economies that allow adequate size raceways to be installed now . . . plus a pull-in, pull-out grounded electrical wiring system that *"Protects now and provides for the future"*. Economies that prove . . . the *best* costs *less* installed.

The economy of installation, too, is a factor, since lightweight Republic ELECTRUNITE E.M.T. speeds handling, lowers installation cost. "INCH-MARKED"® in feet and inches on all popular sizes for fast, accurate measuring every time. Full length "GUIDE-LINE" helps keep bends in the same plane. And exclusive "INSIDE-KNURLING" makes wire pulling as much as 30% easier.

ELECTRUNITE E.M.T. offers complete wiring protection to meet local, state, as well as the National Electrical Code. Produced to A.S.A. Specification C80.3 and Federal Specification WW-T-806, latest revisions, ELECTRUNITE E.M.T. carries the Underwriters' Laboratories Seal of Inspection.

Investigate these money saving advantages that may be applied to the purchase of additional load-building equipment and conveniences. Then you will see why it's good business for utilities to recommend Republic ELECTRUNITE E.M.T. to their customers, and for their own use.

See your Republic representative. He can supply you with complete information first-hand. Or use the coupon below and write direct.

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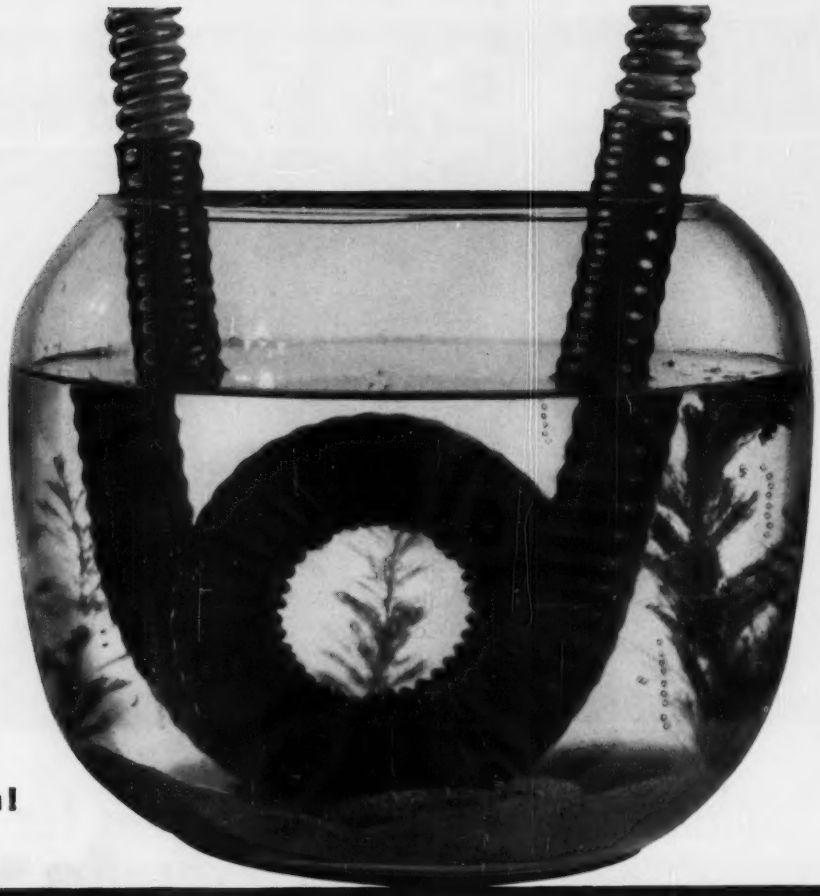


...it must be
C-L-X*
cable sheath!

Simplex C-L-X is a Continuous Lightweight Exterior corrugated metallic sheath. It is a *completely enclosed and impervious* cable system that possesses lightness, strength and a pliability that is limited only by that of the Simplex ANHYDREX, Polyethylene, PLASTEX or varnished cloth insulated cable it contains.

C-L-X combines the advantages of lead sheathed and interlocked armored cables, yet its great mechanical strength and impermeability is achieved with very little weight.

Countless installations over the past decade have proved the dependability and long life of C-L-X design — whether installed aerially or buried directly in the ground, or in trays.

*(Continuous Lightweight eXterior, pronounced "sealex")

Thermoplastic jacket may be color-coded for easy visual circuit identification or voltage ratings.

C-L-X continuous metallic sheath completely encloses the cable system.

C-L-X accommodates the Simplex built-in cable of your choice, for all kinds of power, control, signal and communication jobs.

LIVE BETTER ELECTRICALLY

Simplex WIRE & CABLE COMPANY

79 Sidney Street, Cambridge 39, Mass.

"The American Manufacturers of transoceanic telephone cables"

SAVE BY USING GraybaR FACILITIES FOR

GIESWEIN Everything Electrical GraybaR ELECTRIC COMPANY

Pull Any Size Pole *Easier*

with the ALUMINUM SIMPLEX POLE JACK

15 Ton Capacity . . . . Weighs only 60 Pounds

Aluminum housing of the Simplex heavy-duty Pole Jack eliminates 35 pounds of weight, without sacrificing a pound of lifting capacity. You can pull or straighten poles, pull butts or move loaded poles without interruption to service—and without digging. Only 60 pounds in weight, it's easy to move from job to job; saves time and work. The husky "I" beam base gives a firm foundation; jack pivots on the base when pawl is disengaged. The A-1538 has 15-ton capacity and 22-inch lift. Comes completely equipped with new alloy steel chain and lever bar.

AERIAL CABLE AND WIRE TENSIONING JACK

Capacity 2 tons.

MANHOLE SHEAVE

Handles up to 3-inches diameter cable or any size winch line.

JUNIOR POLE JACK No. 325

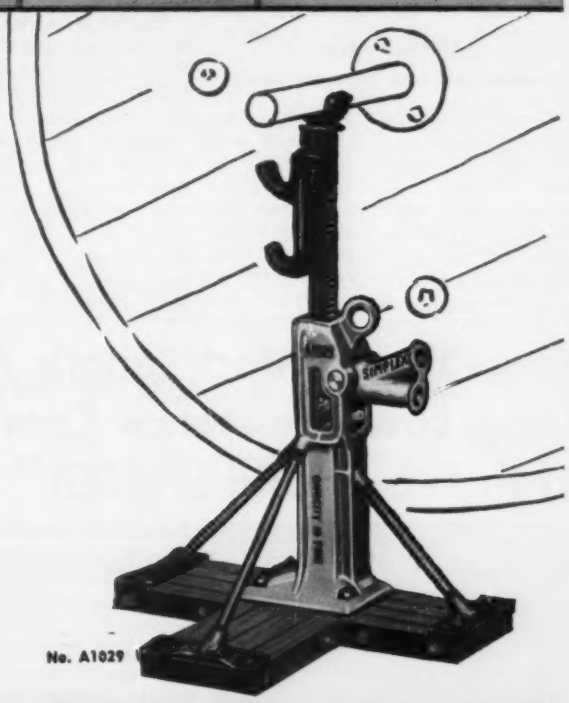
Pulls or straightens poles up to 30 feet high. 5-ton capacity.

Simplex ALUMINUM Reel Jacks

for safe handling of all reel sizes

No. A1029—Single Acting, 10 Ton Capacity. Aluminum alloy housing reduces weight 21 pounds. For outside work where footing may be uneven. T-shaped base has total area of 319 square inches, with three threaded and adjustable steel rods insuring a firm, non-rocking foundation. Furnished with left and right hand bases; Jacks are generally paired to keep operators in sight of each other for even lifting. Handles reels from 36" to 84" in diameter. Equipped with 3 lifting hooks 17", 23" and 29", respectively, from ground level. Top hook for 3" spindles, and the other 2 for 2½" spindles.

Get full information now from your Graybar Branch, or write for Utility Bulletin



No. A1029

WORLD'S LARGEST MANUFACTURERS OF INDUSTRIAL MECHANICAL AND HYDRAULIC JACKS

SIMPLEX JACKS

TEMPLETON, KENLY & COMPANY

2515 Gardner Road • Broadview, Illinois

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T&B Offers Most Complete Splicing Line; Only Line Installed with Pocket-Size Tool

ELIZABETH, N. J. — The Thomas & Betts Co. has introduced the most complete line of splicing equipment available today. The complete line includes *all* connectors commonly used in service and distribution wiring. And all T & B connectors are installed with the SHURE SQUEEZER® Tool, a compact, lightweight splicing tool that gives perfect compressions with only one hand.

Line is Complete and Practical

Main components of the complete T&B line include: SHURE SPLICER®* Sleeves, highly efficient and economical connectors for splicing service drops and distribution lines; PALTAP†* Connectors, the only parallel tap connector that can be installed with a pocket-size tool; TWINTAPS,†* the only compression tap connectors designed to accept two tap conductors; ANGLE TAPS,* installed with the SHURE SQUEEZER, to provide smooth, good-looking right angle tap connections; and PIN TERMINALS, ideal for wiring transformers, cutouts, and all types of line equipment with aluminum conductors.

All Connectors Compounded and Vacuum Packed

These T & B splices and taps comprise a utility connector line with joint compound provided in all joints. It is the *only* connector line vacuum packaged to assure clean, efficient connectors, and the *only* utility connector line that comes to the user with wire sizes printed clearly on attached cards, to eliminate mistakes in wiring.

Compact Compression Tool

The T & B line is also unique because it is the only line that can be installed with a pocket-size tool — the UT2 SHURE SQUEEZER. This revolutionary new splicing tool measures 9½ inches and weighs only 20 ounces. Most linemen find the SHURE SQUEEZER easy to operate with one hand. It is the only tool which gages the compression every time — won't release until the compression is perfect. It's as handy and useful as line pliers — and just as easy to use.

The small size of the SHURE SQUEEZER also makes it easier for the worker to position the tool properly, to insure getting the right number of compressions to secure the connectors. The lineman can keep the tool with him all the time because it fits easily into his pocket. And the compactness of the SHURE SQUEEZER also insures the worker's safety when clearance between conductors is at a minimum. The SHURE SQUEEZER operates in much less room than average compression tools.

King-Size Contact Length Assures Long, Low-Resistance Contact With T&B SHURE SPLICER®* Sleeves

PERFECT COMPRESSION with every squeeze of the UT2 tool — compression gage guarantees a full bite — no mistakes.

Four compressions on wire sizes up to #2 solid, and five on larger sizes, assure broad electrical contact between the conductors and T & B SHURE SPLICER Sleeves.

The SHURE SPLICERS come to you individually vacuum packed. They are firmly attached to perforated cards, and each card carries complete identification of the splicer. The sleeves are identified by wire size, too, so there are no guesses as to size. In addition, each 5-pack card has installation instructions printed on the back.

Each splicer comes to you already provided with T & B joint compound. This joint compound keeps out moisture, provides high pullout, and keys the conductor to the connector. Extensive testing has proved that T & B joint compound gives significantly better contacts and provides lowest contact resistance.

There are millions of SHURE SPLICER sleeves now in use—and the men who install them report that they get better splices much more easily with a SHURE SPLICER and a UT2 SHURE SQUEEZER.

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

T&B PALTAP™* "Tailor Made" for Overhead Wiring Conditions

PALTAP Connector the Only Parallel Tap Connector You Can Install With a Plier Size Tool

EASY WORK ON THE POLE—T&B PALTAPS are ideal for any tap connection.

Conditions in overhead line wiring require tap connectors that can be installed with small compression tools that operate with a minimum of clearance. In these instances, installation of T&B PALTAPS with the T&B SHURE SQUEEZER is especially valuable — less room is needed *than for bolt type clamps!*

The PALTAP design comes in five sizes, covering all wire combinations in the UT2 range. Since the SHURE SQUEEZER requires only a minimum of operating space, the branch conductor can be aimed at virtually any angle, for the convenience of the lineman. If poles must be relocated, the PALTAP can easily be removed simply by cutting the web. Standard line pliers will do the job, and what remains is a smooth sleeve the size of an ordinary repair sleeve.

Where bi-metal tap connections are involved, the PALTAP spaces aluminum and copper conductors well apart to inhibit corrosion. The PALTAP also makes an inexpensive, efficient service dead-end.

Altogether, the PALTAP, installed by the UT2 SHURE SQUEEZER, provides an easier, safer, quicker way to make parallel tap connections. The PALTAP is an exclusive design of The Thomas & Betts Co.

T & B TWINTAP™ The Only Connector Designed for Two Tap Conductors*

Saves space at poletaps where wiring space is at premium

With the introduction of the T & B TWINTAP, it is now possible to make two tap connections to a single compression tap connector. A solid barrier in the tap portion of the connector separates the tap conductors and assures even distribution of the T & B Joint Compound.

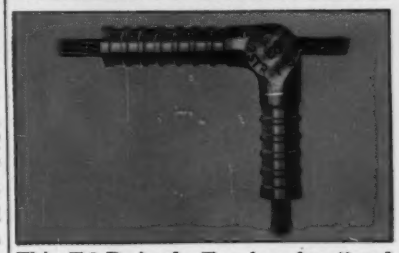
Designed primarily for housing development wiring, where as many as four services are tapped from a single pole, the TWINTAP saves valuable space. Two TWINTAP connectors can handle the work of four ordinary tap connections. This space-saving feature is especially valuable in cases where a service and a transformer are wired at the same pole. Whatever the application, however, the TWINTAP can give you real economies in labor and material costs.

Some customers report that they prefer the TWINTAP in all tap applications, even though a single tap is adequate for the time being. The unused tap bore can readily be capped or covered with tape. When the time comes to install transformers or other additional services or equipment, the new conductor can be connected to the already installed TWINTAP with a minimum of time and labor.

The TWINTAP can be readily converted to an efficient, economical stirrup by installing a copper bail.

T & B PIN TERMINAL — just right for wiring transformers, cutouts with aluminum wire. Compression connection is made with the UT2, and the tinned copper shank is tightened in the equipment terminal, to provide a copper-to-copper bolted joint.

New T&B Angle Tap* Gives Smooth, Flash-free Connection



This T & B Angle Tap has functional good looks—sharply embossed identification lettering—clear-cut serrations in the wire grooves—and the compression joint you get when the Angle Tap is installed is smooth, efficient, professional-looking, with no "flash" at all.

The T & B Angle Tap is first choice with utility men who prefer to have the tap conductor run perpendicular to the tapped line. Angle Taps can be installed with hot line tools. The main portion fits in the tool head and can readily be placed over the line.

Products of The Thomas & Betts Co. are sold only under the T & B plan of 100% wholesaler distribution. Ask your local electrical wholesaler for a demonstration and samples of T & B products. For complete product data on the SHURE SPLICING line, fill out the coupon below:

AUTHORIZED DISTRIBUTOR T&B ENGINEERED

THE THOMAS & BETTS CO.
INCORPORATED

14 Butler Street, Elizabeth 1, New Jersey
Thomas & Betts, Ltd., Montreal, P.Q., Canada

Please send me complete information on T&B's SHURE SPLICER line. My local distributor is _____.

Name _____

Firm _____

Address _____ City _____ State _____

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

† Trade Mark

* Patent Pending

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR ELECTRIC COMPANY

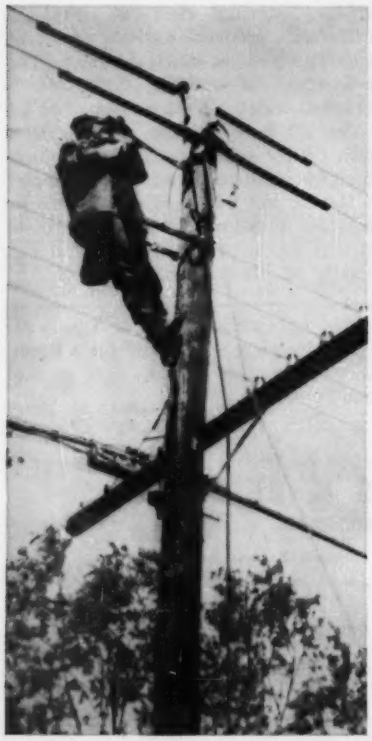
FOR THE EXACT TOOL ON THE EXACT JOB CHOOSE

Powerful Thor Electric Tools

DRILLS Thor's series of universal electric drills have earned a reputation for high quality and outstanding performance. Stand-outs wherever durability and reserve power are desired. All ball-bearing construction and Thor-built motors assure long life on the job. In ¼" to 1¼" capacities. Complete range of speeds, angle attachments and accessories.

IMPACT WRENCHES You name the job, Thor has the impact wrench to fit. All Thor wrenches are reversible. Deliver two hard rotary blows for every spindle revolution. No torque reaction. Cannot stall or burn out. Prices start at a low $94.50 for a ½" drive wrench. Heavy duty ½" and ⅝", angle attachments, accessories, kits available.

HAMMERS Here's a pair of Thor utility hammers unmatched for quality or versatility. Model 15 air hammer has exclusive stop rotation. Four tools in one —demolition tool, drill, clay digger and chipping hammer. Weighs only 15 lbs. Need an electric hammer? Thor's U-100 hammer breaks up concrete, gouges or shapes wood—scales metal, drills stone, concrete.



THOR REVERSIBLE DRILLS—Heavy-duty Thor EJ9RT reversible drill has wide use by telephone and utility company linemen. Reversible feature is highly important for fast, easy withdrawal of bit from hole.

GRINDERS You can remove more metal per minute on the toughest jobs with Thor grinders. The secret is the smooth transmission of power through highest quality anti-friction bearings. Straight grinders in 4", 5" and 6" sizes. Angle grinders with 7" or 9" depressed centers for cut-off operations. Angle grinders in 4" and 6" cup wheel type for general grinding.

SAWS You can cut your lumber and your costs faster with any of the seven powerful Thor saws. Save costly labor time—build up profits per job. Just look at the selection you get: two 6½" models, two 7½" models, 8¼", 10" and 12" models. Prices start at a low $49.95. 9 blade types and a variety of abrasive discs are offered as accessories.

For the tools that do more, you'll choose Thor every time because building quality tools has been Thor's only business for 64 years. We know how to make tools better and how to service them better. Thor maintains service facilities in twenty-three cities and sells only through qualified distributors. Choose Thor—for the exact tool on the exact job. Thor Power Tool Company, Prudential Plaza, Chicago 1, Illinois.

Thor PORTABLE POWER TOOLS

THOR POWER TOOL COMPANY, CHICAGO

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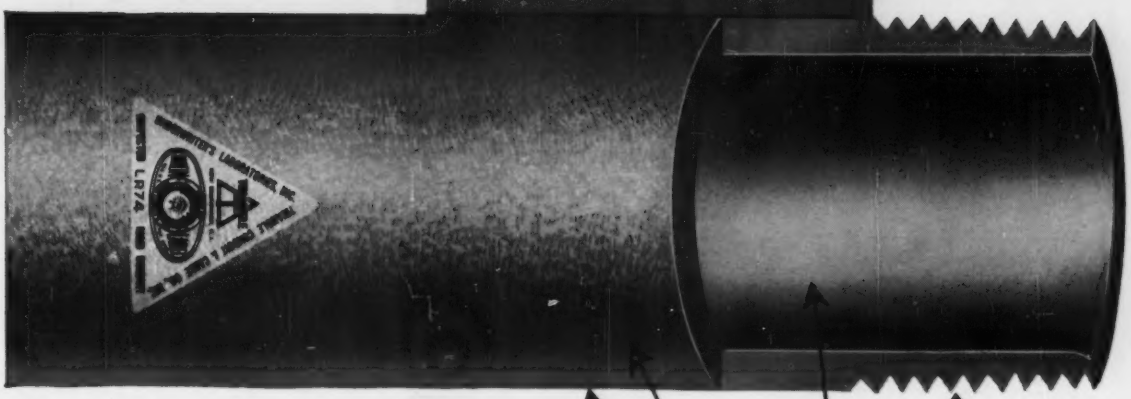
BEAT **BOTH**

CORROSION and ROUGH HANDLING



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TRIANGLE

HOT-DIPPED GALVANIZED CONDUIT

All metal protection—no damageable films

Easy bending, cutting and threading—high grade ductile steel

Uniformly heavy zinc deposit, inside and out

No flaking, inside or out, even if crushed

Triangle Hot-Dip Galvanized Rigid Conduit is made the thorough way with no short cuts. It costs more and takes considerable know-how to make conduit the hot-dip way, but this is the only way to insure a smooth uniformly galvanized product with no thin spots or holidays for corrosion to get a start.

The virgin zinc is alloyed with the conduit walls, so it stays where it belongs in spite of bending, crushing, or rough handling. And Triangle Hot-Dip Galvanized Conduit is all-metal—no need to worry about injury to protective films or flash coatings.

So, when the Code calls for galvanized conduit, make sure you get the best—specify Triangle.

It Must Be Right

The Trade Mark of TOP Quality

TRIANGLE

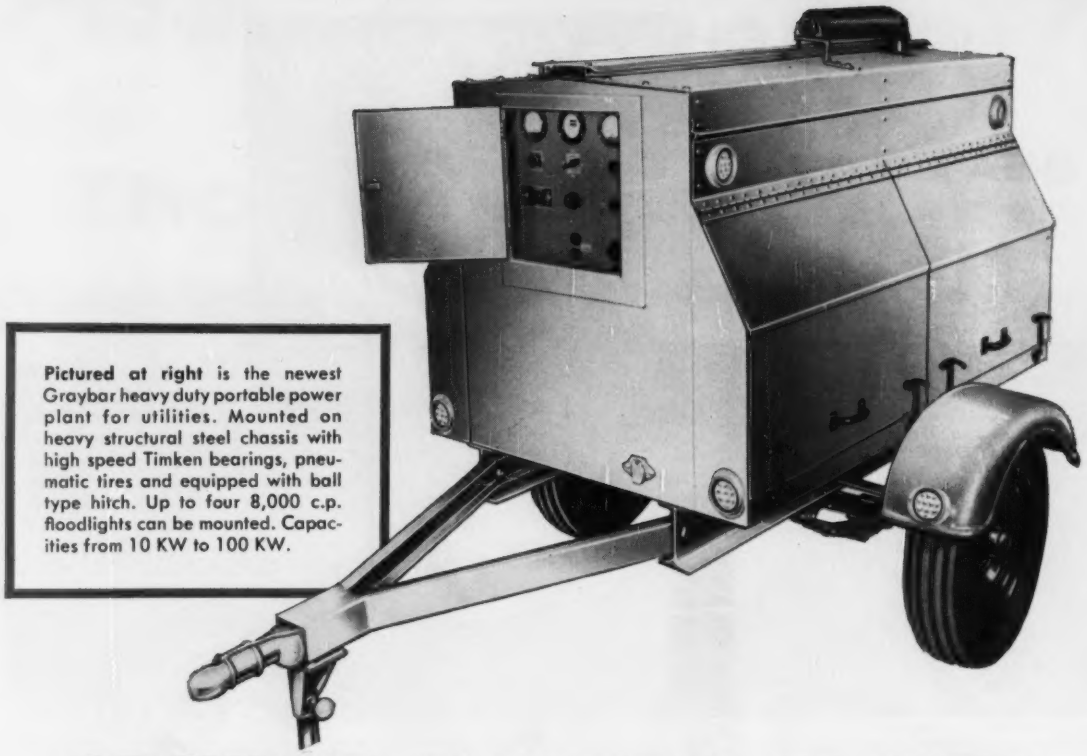
TRIANGLE *Conduit and Cable Co., Inc.*

NEW BRUNSWICK, NEW JERSEY

MOUNDSVILLE, WEST VIRGINIA

SAVE BY USING **GraybaR** FACILITIES FOR

Everything Electrical GraybaR



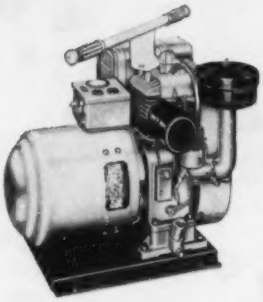
Pictured at right is the newest Graybar heavy duty portable power plant for utilities. Mounted on heavy structural steel chassis with high speed Timken bearings, pneumatic tires and equipped with ball type hitch. Up to four 8,000 c.p. floodlights can be mounted. Capacities from 10 KW to 100 KW.

GRAYBAR ELECTRIC PLANTS

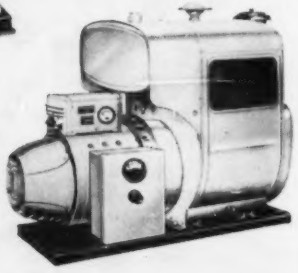
reliable power . . . where and when you need it

Here is a complete line of reliable power plants for emergency or continuous operation. Built for Graybar by Winpower Manufacturing Company, the units are available in air cooled models for outputs of 400 to 15,000 watts, and in water cooled models rated at 5 KW to 100 KW. You can now order these units in all standard voltages, phases and frequencies.

Rugged construction, conservative engine ratings, and simplicity of the units assure trouble-free operation and rated output even under the most severe conditions . . . cost less to own . . . cost less to operate. For helpful data on these reliable power plants, write to Graybar on your company letterhead. Please state type of service for which you need power.



This 1500 watt Graybar gasoline electric plant is air cooled and can be wired for manual or remote starting. 115 or 230 volts.



This remote starting Graybar gasoline electric plant has a capacity of 10,000 watts, is air cooled and can be supplied to deliver 115, 230, 115/230 or 120/208 volts, AC. Suitable for standby service.

CALL **GraybaR** FIRST FOR . . .

Graybar Everything Electrical Graybar Electric Company — Since 1869 — Reg. U.S. Pat. Off.

GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK

IN OVER 130 PRINCIPAL CITIES

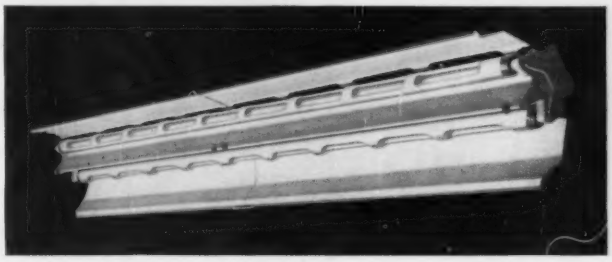
SAVE BY USING **GraybaR** FACILITIES FOR

Suspended 30 feet above the playing court of the Boston Badminton and Tennis Club are two rows of Wheeler Power-Lume fixtures with G. E. Power-Groove lamps. Beneath this new indoor sportslighting development, players (above) open a match in bright, glarefree, shadowless light. Completing the ideal lighting situation, club members note no discernible stroboscopic or "flicker" effect when they or the ball are in motion. Footcandle level runs from 35 at net to 30 at baselines.

A SPORTS LIGHTING FIRST— WITH WHEELER POWER-LUME FLUORESCENT FIXTURES

Boston Badminton and Tennis Club's recently relighted court represents a major breakthrough in indoor sportslighting as newly developed Wheeler Power-Lume fixtures with Power-Groove lamps are installed. Lamp grooves are positioned downward at an angle of 50° from the vertical for the primary purpose of obtaining excellent flat-bottomed candlepower distribution. This eliminates undue concentration of light directly below fixtures. The result is much less glare and no "flicker", with a minimum number of rows required for uniform illumination over a given area.

Power-Lume by Wheeler — America's most versatile new fixture in 2 types of construction, "F" and "V" . . . specifically designed to utilize fully the extra illuminating power of the new Power-



Groove lamps. Delivers *twice* the amount of lumen output per foot of lamp length. For complete details, write for New Product Data Sheet No. 100 D.

Wheeler REFLECTOR COMPANY

(Division of Franklin Research Corp.)

275 Congress Street, Boston 10, Mass.

Distributed Exclusively Through Electrical Wholesalers

SAVE BY USING GraybaR FACILITIES FOR Everything Electrical GraybaR

Use your nearest GRAYBAR OFFICE to order ANYTHING ELECTRICAL

Through Graybar you have ready access to "Everything Electrical" for your routine as well as emergency needs — every day. Information, price and delivery data await your phone call, either on specialized or routine needs. Graybar offices and warehouses are located in these cities:

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GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, N. Y.
IN OVER 130 PRINCIPAL CITIES

SAVE BY USING GraybaR FACILITIES FOR

Shipments, Orders and Open Manufacturing Capacity for Electrical Equipment, 1957-1961

Total Capacity Shipped and on Order and Scheduled for Shipment	Shipped 1957	Shipped First 3 Months of 1958	Scheduled as of April 1, 1958: Last 9 Months of 1958	1958	1959	1960	1961 And Later	Total Scheduled for Shipment as of 4-1-58	New Orders Placed 1-1-58 to 4-1-58
LARGE STEAM TURBINE-GENERATORS[2] (10,000 Kw and Larger)[4]									
U. S. El Pwr Sys[1]	10,237,200	2,993,300	11,335,800	14,329,100	10,415,600	7,362,800	928,200	30,042,400	188,700
U. S. Industrials	1,302,000	12,500	166,500	179,000	75,000	500,000	.....	741,500	.....
Outside U. S.	675,500	349,500	674,600	1,024,100	1,909,900	50,000	.....	2,634,500	75,100
TOTAL	**12,214,700**	**3,355,300**	**12,176,900**	**15,532,200**	**12,400,500**	**7,912,800**	**928,200**	**33,418,400**	**263,800**
Est. Open Capacity[3]	.....	.....	.....	100,000	1,000,000	6,500,000	15,000,000[10]		
SMALL STEAM TURBINE-GENERATORS[2] (4,000 to 9,999 Kw)[4]									
U. S. El Pwr Sys[1]	45,600	12,500	15,600	28,109	13,500	.....	.....	29,100	13,500
U. S. Industrials	151,900	11,300	38,400	49,600	15,000	.....	.....	53,400	.....
Outside U. S.	96,300	9,300	58,900	68,300	.....	.....	.....	58,900	9,400
TOTAL	**293,800**	**33,100**	**112,900**	**146,000**	**28,500**	.....	.....	**141,400**	**22,900**
Est. Open Capacity[3]	.....	.....	.....	30,000	350,000	600,000	600,000[10]		
STEAM GENERATORS (450-Psi Pressure and Higher)[5]									
U. S. El Pwr Sys[1]	95,184	23,435	81,938	105,373	62,385	6,250	.....	150,573	5,135
U. S. Industrials	26,166	3,701	9,804	13,505	6,990	.....	.....	16,794	2,029
Outside U. S.	12,202	6,052	15,932	21,984	5,345	485	.....	21,762	1,444
TOTAL	**133,552**	**33,188**	**107,674**	**140,862**	**74,720**	**6,735**	.....	**189,129**	**8,608**
Est. Open Capacity[3]	.....	.....	.....	4,000	65,000	160,000	170,000[10]		
STEAM GENERATORS (450-Psi Pressure and Higher)[6]									
U. S. El Pwr Sys[1]	110,027	26,986	94,535	121,521	71,226	7,012	.....	172,773	5,683
U. S. Industrials	31,879	4,325	11,255	15,580	8,312	.....	.....	19,567	2,418
Outside U. S.	13,587	6,815	18,009	24,824	5,908	504	.....	24,421	1,565
TOTAL	**155,493**	**38,126**	**123,799**	**161,925**	**85,446**	**7,516**	.....	**216,761**	**9,666**
WATERWHEEL GENERATORS[7] (4,000 Kw and Larger)[4]									
U. S. El Pwr Sys[1]	1,700,000	899,700	1,270,100	2,169,800	1,658,600	2,193,900	625,300	5,747,900	2,998,100
U. S. Industrials	.....	.....	.....	.....	.....	.....	.....	.....	.....
Outside U. S.	47,900	.....	153,500	153,500	.....	.....	.....	153,500	.....
TOTAL	**1,747,900**	**899,700**	**1,423,600**	**2,323,300**	**1,658,600**	**2,193,900**	**625,300**	**5,901,400**	**2,998,100**
Est. Open Capacity[3]	.....	.....	.....	100,000	1,000,000	1,500,000	3,000,000[10]		
HYDRAULIC TURBINES (5,000 Hp and Larger)[8]									
U. S. El Pwr Sys[1]	2,600,100	1,166,000	1,305,000	2,471,000	3,657,000	1,936,600	771,000	7,669,600	525,700
U. S. Industrials	.....	.....	.....	.....	.....	.....	.....	.....	.....
Outside U. S.	45,000	124,600	168,000	292,600	218,000	.....	.....	386,000	110,000
TOTAL	**2,645,100**	**1,290,600**	**1,473,000**	**2,763,600**	**3,875,000**	**1,936,600**	**771,000**	**8,055,600**	**635,700**
Est. Open Capacity[3]	.....	.....	.....	100,000	750,000	2,750,000	4,000,000[10]		
POWER TRANSFORMERS (501 Kva and Larger)[9]									
U. S. El Pwr Sys[1]	70,005	13,794	27,805	41,599	14,259	5,994	1,393	49,451	11,360
Outside U. S.	2,073	361	541	902	105	.....	.....	646	245
TOTAL	**72,078**	**14,155**	**28,346**	**42,501**	**14,364**	**5,994**	**1,393**	**50,097**	**11,605**
Est. Open Capacity[3]	.....	.....	.....	37,500	65,500	74,000	79,000[10]		

[1] U. S. Electric Power Systems. [2] Estimated open manufacturing capacity for production of additional units. [3] Manufacturers' maximum rated capability. [4] Figures in Kilowatts. [5] Figures in 1,000 lb steam per hr. [6] Figures in heat output, millions Btu per hr. [7] Manufacturers' rating of generators. [8] Figures in horsepower. [9] Figures in kilovolt-amperes. [10] Estimated open manufacturing capacity only for 1961.

Bigger Generating Units Are Being Installed

Over 90% of new thermal generating capacity being installed by U. S. electric utilities as part of their expansion programs from January 1, 1958 through 1961 and later, will be in units of 100 Mw or larger. In fact over 17% will be 300 Mw units and larger.

The 1958 utility expansion programs call for installation of 7,791 Mw more generating capacity than last year. Units scheduled for commercial operation this year aggregate 49,728 Mw as of April 1. In April, 1957, the total was 46,372 Mw.

The increasing size of thermal electric generators going on utility lines was only one of several significant features of the Edison Electric Institute's 23rd Semi-Annual Electric Power Survey.

This survey covers steam-turbine generators, steam generators, waterwheel generators, hydraulic turbines, and power transformers. The data, compiled as of April 1, relate to shipments, scheduled production, and estimated open manufacturing capacities for the years 1958 through 1961.

It includes totals for U. S. electric power systems, industrials, and foreign installations. Information was furnished by 19 of the country's leading manufacturers of heavy electric power equipment. Data on steam turbine-generators are based on manufacturer's maximum rated capability, and generators for hydraulic turbines on nameplate ratings.

Records have been established on five additional points covered by data in the EEI survey:

- At 15,761 Mw for 1958, additions of generating capacity are the highest scheduled for operation in a calendar year.
- Scheduled deliveries of large

(*Continued on page* 156)

Generating Capacity

(*Continued from* page 155)

steam-turbine generators reached a new high for a calendar year, totalling 15,532 Mw in 1958. This exceeds 1957 high by 28%.

• Largest steam generator to be ordered has a steam capacity of 3.850 thousand lb per hr, or a heat output of 4,235 million Btu. Destination: Tennessee Valley Authority.

• Largest waterwheel generators ordered and largest order placed were for 13 identical units of 150.3 Mw each, for the Lewiston project of State of New York Power Authority.

• Largest hydraulic turbines on the order board are 13 units, each rated 200,000 hp, also for the Lewiston project.

Other significant facts revealed by the survey were these:

Manufacturing Capacity . . . Total production capacity of manufacturers generating equipment is close to 20,100 Mw (16,500 Mw thermal and 3,600 Mw hydro.

For steam generators, the capacity is 170 million lb per hr, the same as 1957.

For power transformers (501 kva and larger), production capacity is 80,000 Mva, the same as for the year 1957.

Production . . . Electric generators (4 Mw and larger) shipped in 1957 set a new record, totaling 14,256 Mw (thermal 12,509 Mw; hydro 1,747 Mw) and exceeding 1954 high by 4%.

Total generator equipment scheduled for shipment in 1958 is another new record, totaling 18,002 Mw (thermal 15,679 Mw; hydro 2,323 Mw). In first quarter of 1958, shipment was 24% of the combined total, or thermal 22% and hydro 39%.

Steam generators scheduled for shipment in 1958 set a record capacity of 140,862,000 lb per hr of steam. This exceeds the record 1957 shipment by 5.5%. First quarter 1958 shipment was 24%.

Backlog for waterwheel generators is a new record. From April 1, 1958 and later, the capacity is 5,901 Mw. Highest previous amount was 5,383 Mw in 1951.

Hydraulic turbines scheduled for

(*Continued on page* 158)

99.6%
SURE

Of all manufacturers of power capacitors only C-D puts each and every unit through a full voltage energization test before shipment to you. This is why C-D delivers an unbeatable 99.6%-sure performance

PERFORMANCE

in the field.

15, 25, 33.3, 50 and 100 KVAR capacitors for every application with lowest dielectric unit stress and highest major insulation level. Invest your purchasing dollar in internal quality—the only place where it counts. See your C-D representative or write Cornell-Dubilier Electric Corp., Dept. EW-6, South Plainfield, N. J.

SPECIFY

Consistently *Dependable*

CORNELL-DUBILIER

POWER-FACTOR CAPACITORS

(*Continued from page* 156)

shipment in 1958 total 2,764,000 hp. First quarter 1958 shipment was 47%.

Power transformers scheduled for shipment in 1958 total 42,501 Mva. First quarter 1958 shipment was 33%.

New Orders . . . Waterwheel generators ordered total 1,953.9 Mw for Lewiston project, 711.6 Mw for Rocky Reach project, or a total of 2,665.5 Mw. In first 1958 quarter, 2,998 Mw were ordered, being mostly for Lewiston and Rocky Reach projects.

MANUFACTURERS BRIEFS

R. E. Uptegraff Mfg Co, Scottdale, Pa., has received approval to use the statement "Listed under the Reexamination Service of the Underwriters Laboratories, Inc." in correspondence and advertising regarding their Type H Transformers.

Southwire Co, Carrollton, Ga., announces five important improvements in aluminum transmission conductor: an increase in minimum conductivity to 62% IACS; higher tensile strength; greater ductility; smoother surface characteristics; and longer weld free conductors.

Anaconda Wire & Cable Co, New York, has a new high-temperature magnet wire known as Silotex-N. Useful in systems up to 500C, the nickel plated conductor has servings of fiberglass, bonded with a silicone resin. For 500C or above, other binders may be used.

Gulton Industries, Inc., Metuchen, N. J., has established a Digital Devices Dept to apply semi-conductor techniques to data acquisition and reduction in analog and digital systems. It will be located at the CG Electronics Corp, Albuquerque, N. M., a Gulton subsidiary.

Aluminum Co of America, Pittsburgh, Pa., is manufacturing an aluminum jacket to enclose right-angle turns in insulated pipelines. First installation of the almost squared-off contour unit is in the Tecumseh plant of Kansas Power &

PROTECTION AND BEAUTY, TOO

There's No Other Paint Like Subox

...Because Subox is the only paint in the United States made with chemically-active lead-suboxide. Unlike the pigments of inert paints, lead-suboxide changes chemically after drying to form an increasingly tough protective coating – rust inhibitive, acid and alkali resistant. Subox effectively safeguards metal surfaces: buildings, transformers, fences.

...Because Subox paint comes in modern, bright pastel shades, as well as darker colors, painting for normal maintenance can produce attractive decoration appropriate for neighborhood surroundings.

...Because Subox covers with a dense, impervious film, a single coat often is sufficient. Subox is both economical and good looking.

Write today for technical literature and color card.

SUBOX PAINTS

Subox Inc.

trade mark

Established 1924
3 Fairmount Plant
Hackensack, N. J.

Light Co where about 400 preformed aluminum elbows were used.

Hoffman Electronics Corp, Evanston, Ill., has developed a system for converting sunlight into electrical power for operating communication systems and signal devices. Basic component is a 12 by 20-in. aluminum panel containing 144 waferthin, circular silicon solar cells.

Sylvania Electric Products Inc, New York, has developed a 1,400-ft fluorescent lighting system for the runway at the Washington, D. C. National Airport. The floodlighting consists of 272 VHO fluorescent lamps installed in lightweight, 30-in. high reflector fixtures extending along both sides of the runway. The company also has contracts for over 50 electronic flash approach systems.

Highway Trailer Co, Edgerton, Wis., reports that it has completed overhauling all models of its earth-boring machines. New features include 33⅓% more clutch, integral winches, plus integral and telescoping derricks providing the machines with dual capacity both to dig holes and set poles.

Major Equipment Co, Chicago, has expanded facilities for the production of Alzak process aluminum reflectors. Fully mechanized handling of several units at one time is reported as the latest advance in this process.

Meridan Corp, Chicago, Ill, has absorbed United Power Control Corp, Tacoma, Wash., formerly known as Pacific Oerlikon. The latter was a subsidiary of the Oerlikon Engineering Co, Zurich, Switzerland.

Ferranti-Packard Electric Ltd, Toronto, Ontario, will be the new company when the merger of Ferranti Electric Ltd, Toronto, and Packard Electric Co Ltd, St. Catharines, takes effect this summer.

Pirelli, Milan, Italy, has begun the general sale of Voltalit, an ethoxyl-resin material for cable terminals and joints for voltages up to 400,000. Excellent adherence to metal is claimed for the material, which also reduces insulator dimensions from that of conventional porcelain, paper and oil.

UP TO 49% SAVINGS on materials alone with

Fine Fanner Superformed FANNGRIPS

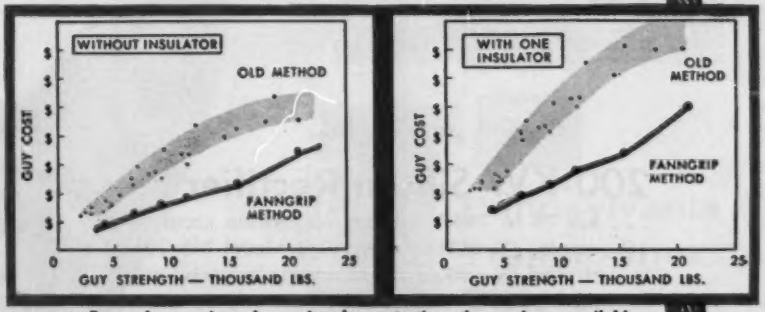
Old style costly methods are eliminated by the use of Fanngrips.

Now . . . costs compiled from typical guying methods using Fanner Fanngrips in comparison to other types of gripping devices show savings up to 49% *in materials alone* . . . in addition to the tremendous savings in time and labor!

Now . . . when savings are so important . . . here is more reason than ever to take advantage of the many Fanngrip features offered by no other type of gripping device:

- Provide maximum strand strengths.
- Eliminate laborious field fabrication.
- Self-clamping, permanently tight.
- Heavy coatings protect from corrosion.
- Do not damage guy strand surfaces.
- Dangerous and wasteful strand ends eliminated.
- Available in "B" or "C" coated galvanized steel, or copperweld.

Ask for cost-saving data today!



Two of a series of graphs demonstrating the savings available through Fanngrips over ordinary gripping methods.

Licensed for use under patent Nos. 2,275,019 and 2,587,521

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Division of Textron, Inc.
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Telephone: SHadyside 1-6000 TWX: CV39

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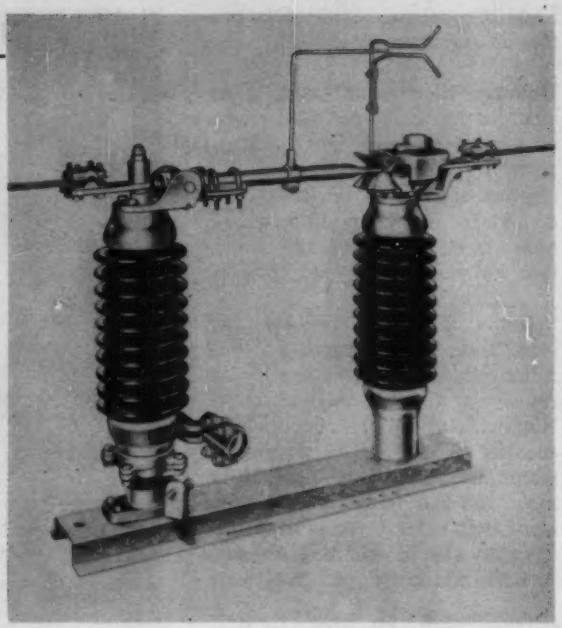
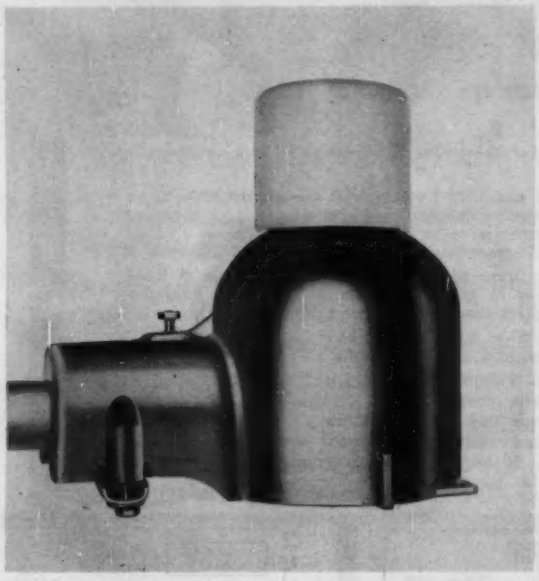
PLASTIC FANNGUARDS · PLASTIC INSULATING TUBINGS AND MOLDINGS

Side Break Disconnect . . .

. . . keeps blade tip aligned even when switch base is distorted by warped supporting structure. Self-adjusting blade has two joints in its anchor to permit 10-deg tilt and 12-deg axial rotation. To provide high leverage ice break and full wiping of current transfer surfaces, spring loaded break-contact swings 30 deg with blade as it opens or closes. On closing, blade tip fully engages break-contact before it moves from 30-deg open position. Bearings at all rotation points minimize operating effort. Switch is rated 600 amp, at 7.5 to 69 kv, and is available for upright, vertical, or underhung mounting.

James R. Kearney Corp, 4236 Clayton Ave, St. Louis 10, Mo.





Tubeless Streetlight Control

. . . for fluorescent, incandescent, or mercury vapor lighting features long life and reliability. Novel adjustable louver distributes light evenly over active surface of cadmium-sulphide cell. Tenite II housing provides additional diffusion. Pilot relay is operated directly by cell, eliminating need for amplifiers. Load relay has positive, non-integrating, 5-sec. time delay to prevent transient light from causing false switching. Settings can be adjusted between 0.5 ft-c turn-on and 6 ft-c turn-off. Load relay contacts are rated one kw.

Line Material Industries, Milwaukee 1, Wis.

200-KW Silicon Rectifier . . .

. . . has 75 to 750-V output. Regulation accuracy is 1%; ripple, 2% RMS. Designated Model MS 708, it is controlled by remote self-saturating magnetic amplifier which permits smooth, continuous adjustment over output range. Cooling air is drawn through rectifiers by forced air up-draft system. Unit is designed for heavy duty applications.

Perkin Engineering Corp, 345 Kansas St, El Segundo, Calif.

(*More New Equipment on page* 162)

There are no pocket bushings on

POLE STAR

Distribution Transformers (or most other distribution transformers today) because a decade ago—when the Pole Star was introduced—Pennsylvania pioneered the use of streamlined, leak-proof, stud-type bushings. Today, as then, let the Pole Star be your guide to the best in distribution transformer design.

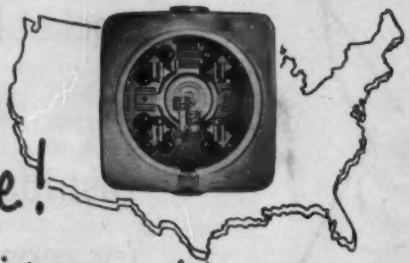
McGRAW EDISON

Pennsylvania Transformer Division

McGRAW-EDISON COMPANY

Canonsburg, Pa.—Greater Pittsburgh District

Quality S-1 Meter Socket Earns Utility Acceptance!



General Electric's top-quality S-1 square meter socket has been accepted by more utilities throughout the country than any other socket in its class.

Ask your G-E salesman. He'll show you the reasons why. 628-15

GENERAL ELECTRIC

Two men and a spinner

Neale MODEL 'K'

CABLE SPINNING EQUIPMENT CO.

3100 Topeka Ave. Topeka, Kans.

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How to CONTROL and ALARM the TOWER LIGHTS of UNATTENDED Microwave and Communication Stations

PHOTO ELECTRIC PANEL
Automatically turns Tower Lights ON and OFF in accordance with FCC regulations
FLASHER PANEL - Automatically flashes Beacon Lamps — with balanced load provisions.
ALARM PANEL - Automatically provides signals indicating failure of any lamp, power or control.

Model LC 201
TOWER LIGHTING CONTROL UNIT
(for Two Light Levels)

Model LC 101 (for Single Light Level)
Model LC 301 (for Three Light Levels)
Models also available with separate Alarm Signal for each Beacon Lamp.

Write for descriptive Bulletins

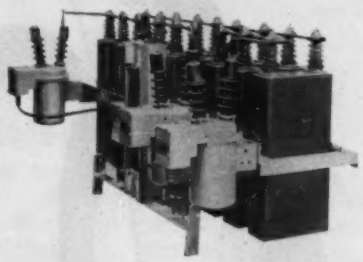
HUGHEY & PHILLIPS, INC.

Manufacturers of
300MM Beacons, Obstruction lights, Photo-Electric Controls, Beacon Flashers, Special Junction Boxes, Microwave Tower Light Control & Alarm Systems, and complete kits for: Tower Lighting, Sleet Melter Power & Control.
3200 N. SAN FERNANDO BLVD.
BURBANK, CALIFORNIA

Service Cable Dead End . . .

. . . has aluminum wedge that fits shell two ways to facilitate installation and eliminate unnecessary twisting of the bail. This cast aluminum, bellied wedge grips all conductors without slipping. Bell mouth open-

ing dampens vibration and eliminates stresses on neutral as it enters wedge. This WDE-2 dead end has conductor range from No. 6 solid to No. 4 ACSR. Solid, detachable bail is stainless steel; shell is aluminum.
Fargo Mfg Co, 845 Main St., Poughkeepsie, N. Y.



Pole Top Capacitors . . .

. . . with structural aluminum frames are lighter and require no protective paint maintenance, even in coastal or industrial areas. Weight of these 60 and 75-kv BIL fixed and switched single row equipments, with 50-kvar capacitors, is 10% less than equivalents with galvanized steel racks. Direct-to-pole mounting provides rigid, two-point contact at lower and upper securing points. Bearing surface of front-of-pole brace has been increased to strengthen support. Equipments are available in ratings of 150 to 600 kvar, for 2.3 to 13.8-kv use.
General Electric Co, Schenectady 5, N. Y.

200-Amp Meter Socket . . .

. . . for four or five-terminal extended range meters is designed to permit all adjustments to be made from the front. This eliminates extra side

(*Continued on page* 164)

INTERLOCKED ARMORED CABLE

For Power Distribution in New Plants or in Modernizing Old Plants For more current capacity than cable in conduit or other armored cable, *specify and buy Rockbestos A.V.C.* . . . for easy installation on racks or hangers beneath the ceiling or next to walls, *specify and buy Rockbestos A.V.C.* . . .

. . . To eliminate costly conduits and ducts . . . to save important dollars on materials and installation time, to permit quick, easy repairs, *specify and buy Rockbestos A.V.C.*

. . . All interlocked armored cables are not alike . . . and, for maximum dollar-savings and maximum performance be sure to *specify and buy Rockbestos A.V.C.* Interlocked Armored Cable — the superior AVA Cable.

Write now for the new Rockbestos manual which gives the application and design data to help you *specify and buy Rockbestos A.V.C.*

ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONNECTICUT

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ROCKBESTOS A.V.C.

THE SUPERIOR A.V.A. CABLE

SHAWMUT'S
TIME-TESTED
SILVER-PLATED

Tri-onic

(Dual-Element)

The General Purpose Fuse

*Interrupting Capacity 25,000 Amps. A.C.

KEEPS MOTOR CIRCUITS SAFE

This is the first low voltage fuse with a published interrupting capacity of 25,000 Amps. (15,000 Amps. more than required by U.L. Standard for fuses.) For real protection use it in place of all ordinary types of fuses.

TRI-ONIC* GIVES 3-WAY PROTECTION

1. **HIGHER INTERRUPTING CAPACITY.** 25,000 A. @ 250 V & 600 V. Handles short-circuits 2½ times larger than ordinary fuses. Expands fuse application into 25,000 Amp. zone. Use it on bus plug-in duct, bus-ways, feeders, motor control panels, branch circuits.
2. **LONG TIME-DELAY.** Safely starts heavily loaded motors without blowing. Prevents circuit "outage" caused by heavy motor-starting currents or load swings. Provides "matched" protection for your motors.
3. **COOLER OPERATION.** Runs cool because of silver-plating and low I^2R losses throughout. Opens at 286° F, or 500° lower than ordinary zinc links. Ideal for distribution and panel boards, motor branch circuits, knife and enclosed switches.

* U.S. Patent Nos. 2,111,749 – 2,300,620 2,321,711

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Tri-onic – "Awake At The Switch"

THE CHASE-SHAWMUT CO.

374 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

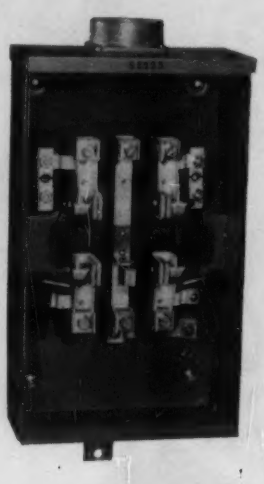
Subsidiary of I-T-E CIRCUIT BREAKER CO., Philadelphia, Pennsylvania

Est. 1893

Tri-onic C-O-T TRIONIC

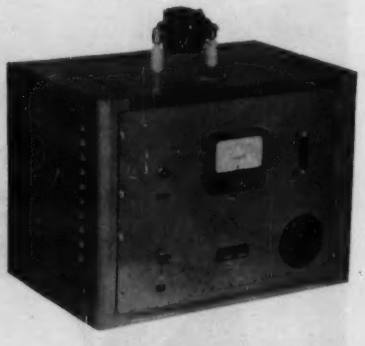
200-Amp Meter Socket

(*Continued from page* 162)



clearances. Three interchangeable blocks are offered: no by-pass; positive automatic type; or manual by-pass with choice of front operated bypass tools. Socket provides high pressure blade control and unit style hub. In the non-clamping position, special terminal clamping handles prevent replacement of front and permit meters to hold position under slightly less than normal spring tension. In the down position, meter is locked in place with over 100 lb pressure.

Milbank Mfg Co, 1111 Virginia, Kansas City, Mo.



HV Insulating Oil Tester . . .

. . . for checking breakdown point of transformer oils and other insulating liquids has zero to 35-kv ac voltage range and 2-kva capacity. Test voltage is accurately metered, directly across the electrodes. Designated

(*Continued on page* 166)

HOLOPHANE Presents Another Vital LIGHTING FIRST

REALITE*...

NEW Luminaire Featuring the
PRISMALUME* *Enclosure*

SPECIAL HINGE CONSTRUCTION permits entire lens section to swing open for easy relamping and servicing.

- HIGH EFFICIENCY · LOW BRIGHTNESS
- VISUAL COMFORT · UPWARD LIGHT
- LIGHTWEIGHT · CONTINUOUS RUNS

Product of the foremost engineers, REALITE heralds a new era in fluorescent illumination. Its ultra-thin design integrates harmoniously with all types of modern interiors: classrooms, offices, banks, stores, libraries, corridors — or any area requiring effective, comfortable lighting . . . Equipped with PRISMALUME, the finest prismatic enclosure ever made for fluorescent lamps. Extremely light in weight, shatter-resistant, discoloration-free, this enclosure provides precise control that results in high-level lighting without accompanying glare . . . Send coupon for engineering and installation data.

FOR BETTER LIGHTING BE SPECIFIC . . . Holophane

HOLOPHANE COMPANY, INC.
Lighting Authorities Since 1898
342 Madison Ave., New York 17, N. Y.
THE HOLOPHANE CO., LTD., 418 KIPLING AVE. SO., TORONTO 14, ONTARIO

*Trademark

HOLOPHANE COMPANY, INC.
342 Madison Ave., New York 17, N. Y.

Please send engineering and installation data on your New REALITE luminaire with PRISMALUME enclosure; no obligation to us.

INDIVIDUAL_____

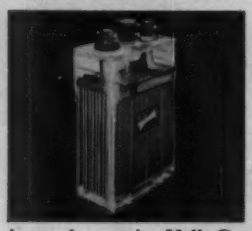
ORGANIZATION_____

STREET_____

CITY_____ ZONE___ STATE_____

New C&D Control Battery installation at Consolidated Edison Co.'s Hell Gate Station, New York City. Installed on old racks, C&D PlastiCell batteries take up one-third less space.

Con Edison saves 1/3 space



...when replacing control batteries by installing C&D PlastiCell

Consolidated Edison, supplying the tremendous power demand of New York City and Westchester, recently replaced another make battery supplying the d-c house bus at its Hell Gate Station with a C&D PlastiCell battery.

The result—

a saving of a third of battery room space.

The C&D PlastiCell battery is used to control the motor-operated valves on gas and steam lines in connection with 900,000 pound per-hour high-pressure boilers and 450,000 pound per-hour low-pressure boilers. In addition, the battery supplies power for sequence trip controls, cubicle switches, forced and induced draft fan controls, and solenoids for motor breakers.

For space-saving, yes—and even more important, for complete dependability, long life, and reduced maintenance, specify C&D—the batteries engineered for control service. That's why C&D is your better battery buy. C&D batteries are engineered to provide a long, trouble-free service life. With PlastiCell (lead-antimony) you get a full 14 years of life and with PlastiCal® (lead-calcium) 25 years.

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Write for descriptive literature.

C&D

C&D BATTERIES, INC.

of Conshohocken, Pa. ... Attica, Ind.

Since 1906

Sales and Service Offices in Principal Cities from Coast to Coast

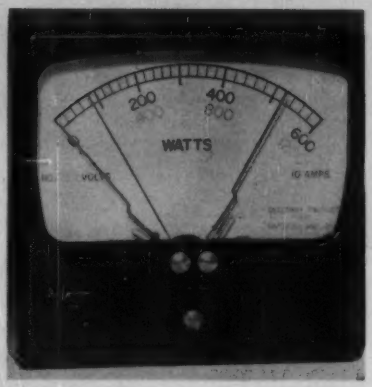
Manufacturers of Sure-Cel® Industrial Batteries • PLASTICELL and PLASTICAL® Batteries for Communications, Control and Auxiliary Power • Producers of Autolay • Silicon Chargers

HV Insulating Oil Tester

(*Continued from page* 164)

Model 4505, it is available with built-in, motor-driven automatic rate of rise control to increase test voltage at 3 kv per sec.

Associated Research, Inc, 3777 W Belmont Ave, Chicago 18, Ill.



Locking Contact Wattmeter

. . . combines direct monitoring and control of power in single instrument. Both high and low power limits may be preset, with control action initiated when limit is reached. Capacity of field coil ranges from one to 20 amp ac. Standard core magnet coil and contact ratings are 25 ma dc, at 75 to 125 v. Higher ratings are available.

Assembly Products, Inc, Chesterton, Ohio

Portable Generator . . .

. . . with 2.5-kw capacity and 115-v d-c output is direct-coupled. This Model EG-2.5D weighs 165 lb and measures 31 x 20 x 19.5 in. Aluminum control box has two 15-amp, three-prong receptacles of the straight bayonet grounding type or, alternately, 20-amp, 125-v twist-lok receptacles. The 4-cycle, single cylinder gasoline engine is air-cooled and had 3,600-rpm rating. Other features are sealed-for-life bearings and long-life commutators and brushes.

Thor Power Tool Co, Prudential Plaza, Chicago, Ill.

NATVAR in Switzerland!

The world renowned firm of Secheron in Geneva has been using Natvar 400 tape to great advantage for years.

The excellent electrical and physical properties of Natvar 400, its exceptional uniformity and ease of application, have made it the choice of leading manufacturers of electrical apparatus and equipment both in this country and abroad.

If you are a user of flexible electrical insulating materials, it will pay you to get in touch with your Natvar distributor or with us direct.

3000 kva, 6300 volt, [illegible] rpm 3-phase alternator built by Secheron of Geneva for installation in Angola.

← Coil ends are neatly wrapped with Natvar 400 extruded vinyl tape for dielectric and mechanical protection.

Natvar

Natvar Products

- Varnished cambric—cloth and tape
- Varnished canvas and duck
- Varnished silk and special rayon
- Varnished—Silicone coated Fiberglas
- Varnished papers—rope and kraft
- Slot cell combinations, Aboglas®
- Isoglas® sheet and tape
- Isolastane® sheet, tape, tubing and sleeving
- Vinyl coated—varnished tubing and sleeving
- Extruded vinyl tubing and tape
- Styreflex® flexible polystyrene tape
- Extruded identification markers

Ask for Catalog No. 24

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FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

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ALUMINUM
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SUPPORT SYSTEMS
FOR POWER AND CONTROL CABLES
IN-FREE-AIR
DESIGNED AND DEVELOPED BY HUSKY PRODUCTS

Mr. Engineer...

Mr. Contractor...

HUSKY
CABLE SUPPORT SYSTEMS
are NOT ONLY
RECOMMENDED and APPROVED
by ALL Leading
CABLE MANUFACTURERS
They are actually SOLD by
MOST of the large cable
manufacturers.

NO OTHER
POWER CABLE SUPPORT
SYSTEM HAS THIS DISTINCTION.

DO YOU KNOW WHY??

The only "electrically sound" system; let us explain...
or...ask your cable manufacturers representative.

ALSO...
Send for your copy of the story of
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NEW LITERATURE

AIEE PUBLICATIONS:

Rotating Electric Machinery Forming a Part of the Power Equipment on Electrically-Propelled Railway Cars, Locomotives, and Coaches (Trolley and Prime Mover). No. 11. $0.60.

Fuses Above 600 Volts. No. 25. $0.80.

Guide for Insulation Maintenance for Large A-C Rotating Machinery. No. 56. $0.60.

Device Numbers and Functions for Pipeline Pump Stations Under Automatic or Remote Control. No. 68. Free.

Test Code for Industrial Control (600 Volts or Less). No. 74. $0.80.

Test Code for Transistors, Semiconductor Definitions and Letter Symbols. No. 425. $1.20.

Test Procedure for Single-Phase Induction Motors. No. 502. $0.60.

Schedules of Preferred Ratings for Power Circuit Breakers. C37.6. $0.35.

Miscellaneous. C42.95. $0.80.

American Institute of Electrical Engineers, 33 W 39th St, New York 18, N. Y.

• **ACTUATOR:** 4-p catalog, V-200, describes automatic valves actuating conversion unit, the Valvmatic. Explains six steps in installation of unit and illustrates each. C. H. Wheeler Co, 19th & Lehigh, Philadelphia 32, Pa.

• **HOISTS: 8-p bulletin, DH-133D,** contains data on construction details, weights, dimensions, suspensions, specifications, clearances, accessibility, and other general information on Speedway Electric Hoists. Wright Hoist Div, American Chain & Cable Co, York, Pa.

• **ALLOY CONDUCTORS:** Complete commercial availabilities of All Aluminum Alloy Conductors for distribution systems are listed in an 8-p booklet, EC 718. Advantages are described and charts on solid and stranded AAC availabilities in AWG sizes from #6 up are featured. Kaiser Aluminum & Chemical Sales Inc, Dept NR-12, 919 N. Michigan Ave, Chicago 11, Ill.

• **ULTRASONIC CLEANING:** 24-p bulletin, S-200, explains practical application and basic principles of ultrasonic cleaning and covers in detail many areas in which it is advantageous. Branson Ultrasonic Corp, Stamford, Conn.

• **INDUCTION MOTOR:** 8-p bulletin No. 1900, gives uses, graphs and illustrations for "Synchro-Spede" synchronous induction motors, Louis Allis Co, 427 E. Stewart St., Milwaukee 1, Wis.

• **HAND TOOLS:** 58 how-to-do-it pictures showing 30 different tools in use are the highlights of 40-p booklet, "How to Use Hand Tools." $0.10. Crescent Tool Co, Jamestown, N. Y.

(*More New Literature, page* 170)

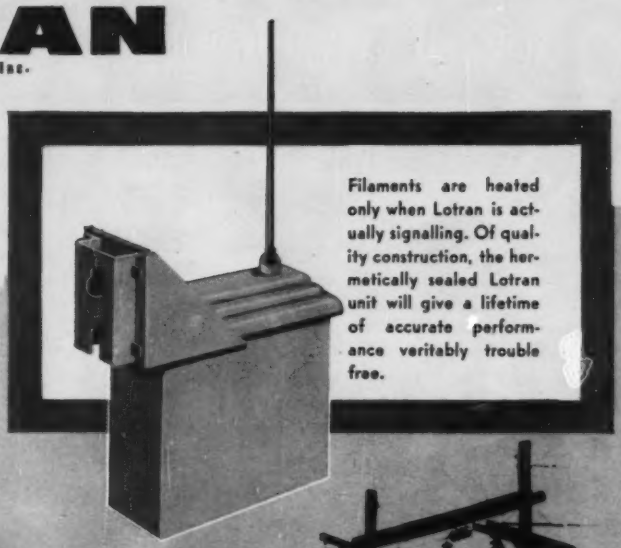
VIA SPACE RADIO

Identify substation feeder faults with LOTRAN

Formerly MOTREL, Inc.

NOW, with only one Lotran unit you can identify exactly which feeder line contains the fault. Lotran's special substation unit with built-in multiple coding device distinguishes *which* substation feeder line is out. If you prefer, a standard Lotran unit can be used as a common identifying alarm to indicate the substation location only.

Lotran is an unmanned FM transmitter licensed by the FCC to signal the location of feeder line power faults. Coupled with circuit breakers or reclosers, Lotran signals the power failure when it occurs. Lotran's distinctive coded signal is transmitted to the dispatcher's receiver and the Lotran automatic recorder.



Filaments are heated only when Lotran is actually signalling. Of quality construction, the hermetically sealed Lotran unit will give a lifetime of accurate performance veritably trouble free.

LOTRAN INCORPORATED

DEPT E P O. BOX 2521 BATON ROUGE. LOUISIANA

PLEASE SEND COMPLETE INFORMATION AND BROCHURE ON LOTRAN

NAME _____

COMPANY _____

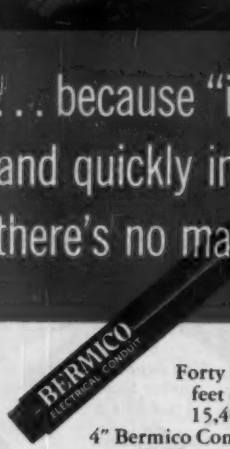
ADDRESS _____

CITY _____ ZONE ____ STATE _____

BERMICO® electrical conduit used at Pungo Naval Air Station

... because "it's light, strong, easily and quickly installed. Costwise there's no match for it," says M.J. Lehtio,

Branch Manager, Clarke Electric Co., Inc., Norfolk, Va.



Forty thousand feet of 2" and 15,400 feet of 4" Bermico Conduit will carry antenna-lead, power, telephone, teletype and intercommunication cables for the new Coast Guard radio installation at Pungo Naval Air Station, Norfolk, Va.

Bermico Conduit is precision engineered from cellulose fibre impregnated with coal tar pitch. It is uniform in quality, with smooth inside bore allowing easy cable pull-through without danger of abrasion. Highly resistant to acids, alkalies, heat, water and corrosion. Bermico is confidently used by leading electrical contractors on this and other government projects, knowing it surpasses Federal Specification W-C-581 by an ample margin.

On your next job why don't you use Bermico? Immediate shipment of all sizes and fittings guaranteed.

Distributed by WESTINGHOUSE Electric Supply Company

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BROWN COMPANY

General Sales Offices: 150 Causeway Street, Boston 14, Mass.
Mills: Berlin, N. H.; Corvallis, Ore.

NEMA PUBLICATIONS:

NEMA Standards Publication for Manufactured Graphite Electrodes. CG1—1958, $0.20.

AEIC-EEI-NEMA Standards for Watthour Meters, EI 20—1058. $0.50.

American Standard Outlet Receptacles, Attachment Plug Caps and Appliance Plugs, WD 1—1956. $1.50.

NEMA Standards Publication for Automatic Circuit Reclosers and Automatic Line Sectionalizers. SG 13—1958. $2.25.

NEMA Standards Publication for Signalling Apparatus. SB 1—1957. $0.40.

EEI-NEMA Standards for Multiple Sockets and Supports Used in Street and Highway Lighting. SH 17—1958. $0.25.

National Electrical Manufacturers Association, 155 E. 44th St., New York 17, N. Y.

• **MASTER SWITCH CONTROL:** Design features and engineering data on master switches are presented in Bulletin 5701A. Contains voltage ratings, application photos, contract arrangements, action and outline diagrams. Furnace Electric, 1026 McKee, Batavia, Ill.

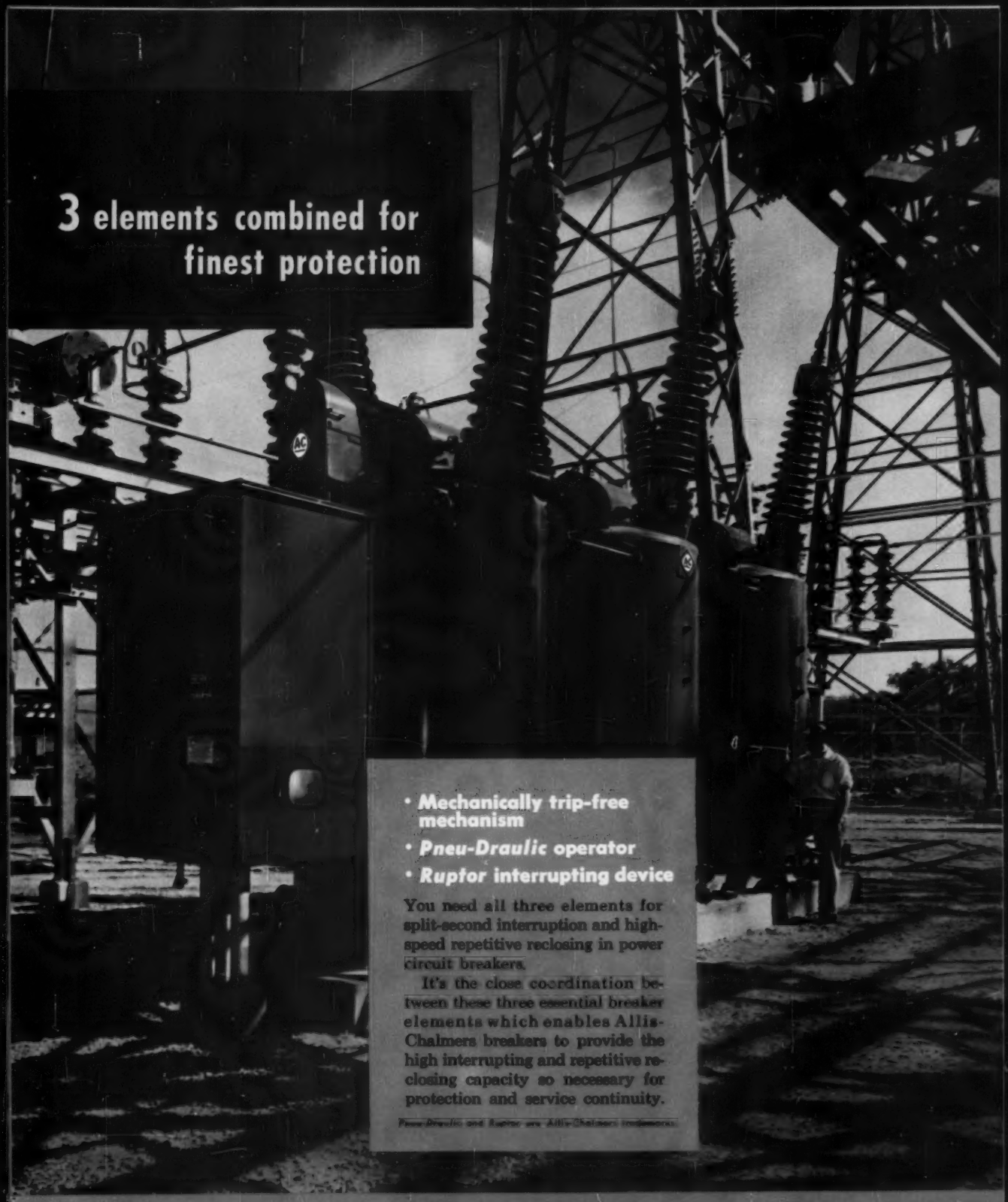
• **PACKAGE EQUIPMENT:** Ring bound catalog features four basic units—hydraulically driven front- and rear-mounted derrick equipment and mechanically driven front- and rear-mounted derrick equipment to simplify job of selecting, specifying and organizing utility company line construction and maintenance trucks. Tel-E-Lect Products, Inc, 10001 Minnetonka Blvd, Minneapolis 26, Minn.

• **ELECTRIC HEATING ELEMENTS:** Data sheet, 45651-3 contains details and specifications on flat, sinuated electric heating elements. Syntron Co, 205 Lexington Ave, Homer City, Pa.

• **RESIN DATA CHART:** Wall chart shows compilation of data for various standard resins. Categories covered are: Stycast casting resins, Eccocoat plastic surface coatings, Eccobond adhesives, cements and sealants, Eccoseal impregnating resins, and Eccobild tooling resins. Emerson & Cummings Inc, 869 Washington St, Canton, Mass.

• **GLOSSARY OF TERMS:** A reference guide to terms used in Temperature and Pressure Measurement is provided in a 20-p booklet. Trans-Sonics Inc, Burlington, Mass.

• **FLOW METER:** 20-p catalog C22-1, covers features, specifications and applications of Bellows Meter. Two basic models are described: One for flow and liquid level in open tanks; the other for liquid level in closed tanks under pressure or vacuum. Specification S292-2 describes construction and operation of Bellows Meter. G. A. Reed, Minneapolis-Honeywell Regulator Co, Wayne & Windrim Aves, Philadelphia 44, Pa.

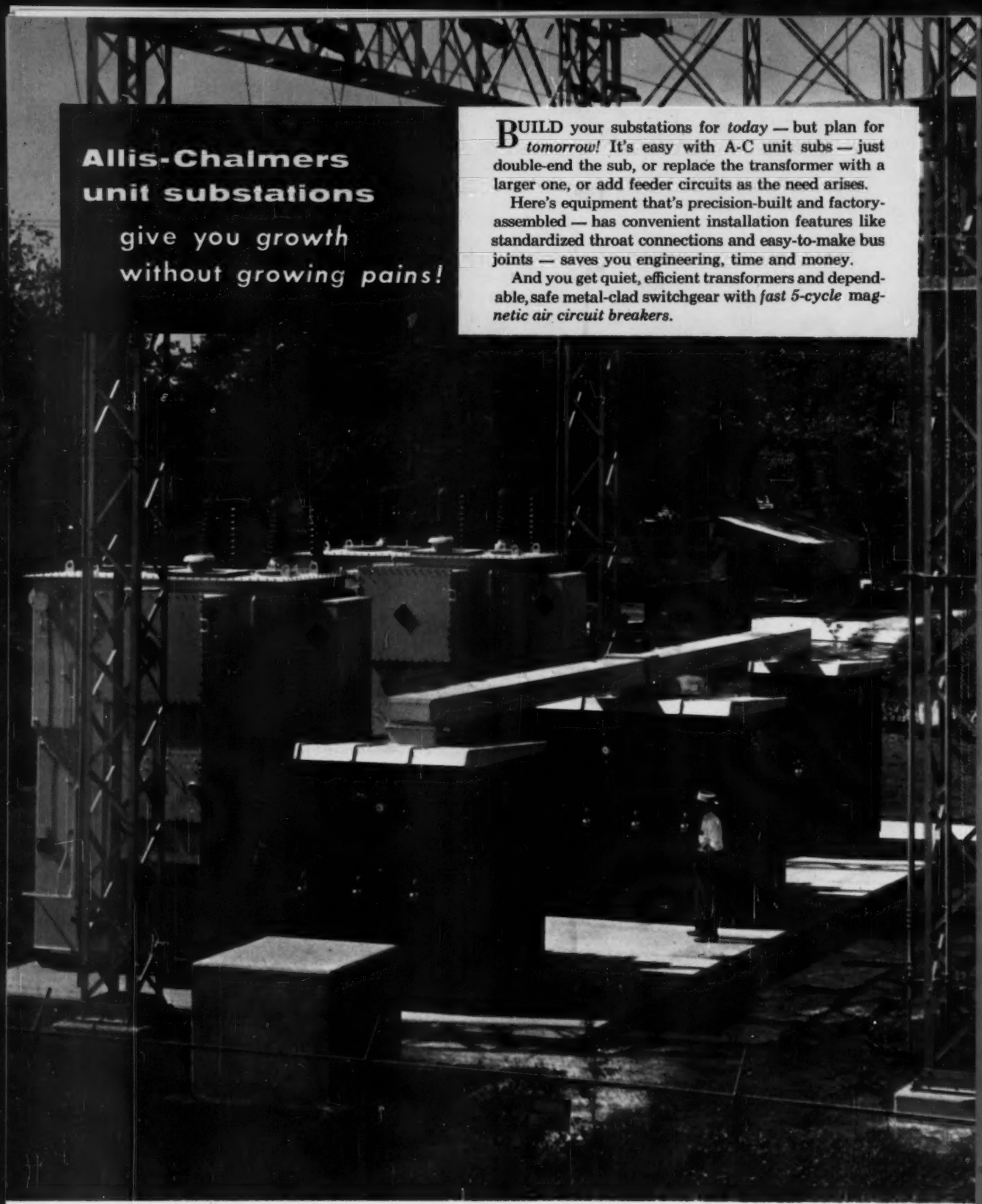

3 elements combined for finest protection
• Mechanically trip-free mechanism
• Pneu-Draulic operator
• Ruptor interrupting device
You need all three elements for split-second interruption and high-speed repetitive reclosing in power circuit breakers.
It's the close coordination between these three essential breaker elements which enables Allis-Chalmers breakers to provide the high interrupting and repetitive reclosing capacity so necessary for protection and service continuity.
Pneu-Draulic and Ruptor are Allis-Chalmers trademarks.

***Get more information** about these high-speed power circuit breakers. Call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.*

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5855



Allis-Chalmers unit substations

give you *growth* without *growing pains!*

BUILD your substations for *today* — but plan for *tomorrow!* It's easy with A-C unit subs — just double-end the sub, or replace the transformer with a larger one, or add feeder circuits as the need arises.

Here's equipment that's precision-built and factory-assembled — has convenient installation features like standardized throat connections and easy-to-make bus joints — saves you engineering, time and money.

And you get quiet, efficient transformers and dependable, safe metal-clad switchgear with *fast 5-cycle magnetic air circuit breakers.*

A-5245

For details regarding A-C unit substations, contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS *for progress in switchgear*

Books

Circuit Theory Explained

Basic Electric Circuit Theory. By W. W. Lewis and C. F. Goodheart. Published by The Ronald Press Co., 15 E 26th St., New York 10, N. Y. 650 pages, illustrated. Price $9.00.

This book covers a large field, certainly larger than what is traditionally considered basic circuits.

About half of the text is devoted to elementary circuits. Series, parallel, network, coupled, and polyphase circuits are discussed. In the second portion of the book the authors present material on such things as hyperbolic functions, Laplace transforms, transmission lines, and short circuit calculations.

Industrial Electronics Primer

Industrial Control Circuits. By Sidney Platt. Published by John F. Rider Publisher, Inc., 116 W 14th St., New York 11, N. Y. 200 pages, illustrated. Price $3.90.

Written for the practical man, this book should be ideal as an introduction to electronic control systems for utility and industrial plant maintenance and operating men. Very little prior knowledge of electronics is required. Electronic relaying and timing circuits, photo-electric control, and motor and welding control are some topics discussed.

Books Recently Received

The Industrial Challenge of Nuclear Energy. Published by The European Productivity Agency of The Organization For European Economic Cooperation. 2, Rue Andre-Pascal, Paris, France. 289 pages. Price $3.50.

Transients in Electrical Circuits. By G. V. Lago and D. L. Waidelich. Published by The Ronald Press Co., 15 E 26th St., New York 10, N. Y. 382 pages, illustrated. Price $7.50.

Introduction to Electromagnetic Fields. By Samuel Seely. Published by McGraw-Hill Book Co, 330 West 42nd St, New York 36, N. Y. 299 pages, illustrated. Price $8.50.

Management and Organization By L. A. Allen. Published by McGraw-Hill Book Co., 330 W 42nd St., New York 36, N. Y. 360 pages, illustrated. Price $7.00.

Heating Ventilating Air Conditioning Guide, 1958. Published by American Society of Heating and Air-Conditioning Engineers, 62 Worth St, New York 16, N. Y. 1272 pages, illustrated. Single copy price $12.00.

I wish we had more time and personnel to prepare for this rate case!

Your staff is overloaded now. Call in the specialists and let them carry the peak load. HOW ABOUT PIONEER?

GIVE YOUR NON-ROUTINE OPERATIONS TO PIONEER

Design and Consulting Engineering Services

Pioneer has specialized in designing power plants for 56 years. It designs fossil fuel, hydro and atomic plants. It forecasts load growth, selects sites, purchases and expedites equipment and supervises construction. Pioneer's other services include substation, transmission and distribution studies and design.

Services in Regulatory Matters

Pioneer offers services in all phases of Federal, State and Local regulation including rate base, depreciation analysis, cost of service studies, market analysis, certificate proceedings and rate of return.

Corporate Services

Pioneer's services in corporate matters include business and management engineering advice, financial, accounting, tax counsel, insurance, and pension planning. It maintains a complete stock transfer, ledger and dividend disbursement service.

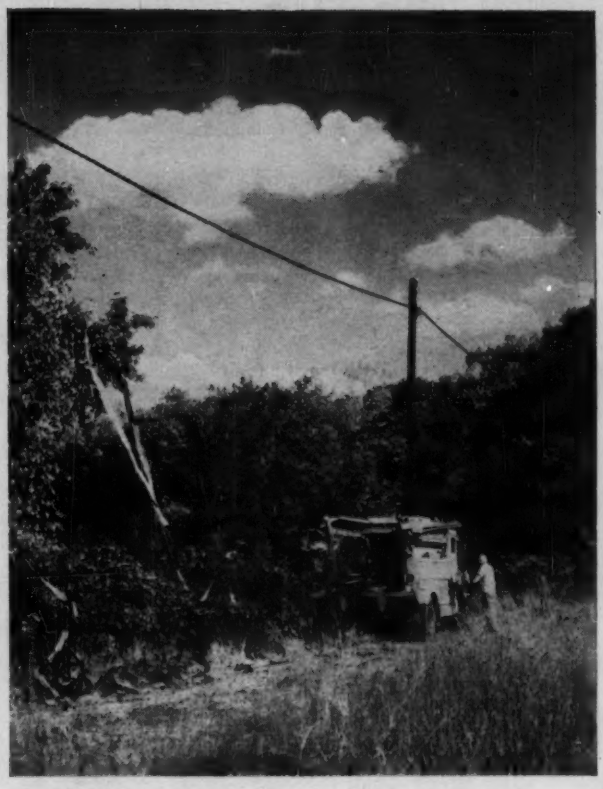
NEW!

On your letterhead, write for 40-page booklet, "Pioneering New Horizons in Power". Describes, illustrates Pioneer's engineering services, and corporate services, from financing to operation.

56 YEARS

Pioneer Service & Engineering Co.

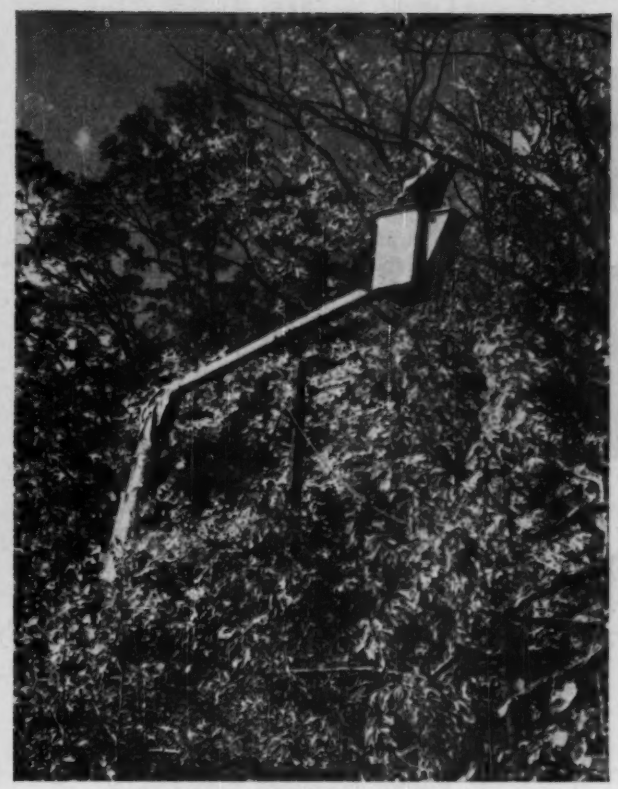
231 South La Salle Street
Chicago 4, Illinois



Additional crossarm hardware, or, in some cases crossarms themselves, are not necessary when using aerial cable.

← In densely wooded areas, the most efficient and reliable method of power distribution is the "aerial cable route."

A line running from the cable trailer to the truck winch pulls the aerial cable over temporary pulleys mounted on the poles.



Both initial and periodic tree trimming are cut to an absolute minimum with Rome's preassembled aerial cable.

Fast, efficient installations, even in densely wooded areas, are possible with Rome's preassembled aerial cable.

Trim your tree-trimming costs with Rome's preassembled aerial cable

Stringing power lines, especially through wooded areas, need not be a time-consuming, expensive installation. Not if you use Rome's preassembled aerial cable.

Because of the staunch characteristics of preassembled aerial cable, both initial and periodical tree-trimming time is cut way down. Initially, you need not clear as much of a right of way for preassembled aerial cable as is necessary in the case of open-wire construction. Periodic tree trimming can be put off for as long as five years, in some cases. This is compared to a normal two-year requirement for open-wire construction.

In residential areas, tree trimming can be a problem. Home owners, who have an inherent interest in the trimming of trees which grace their property, are very interested in the amount of trimming that is necessary. When using Rome's preassembled aerial cable, it is not necessary to disturb the trees as much as in the case of open-wire installations.

In addition to the tree-trimming advantages of Rome's preassembled aerial cable, there are many other "reliability" factors which you get by specifying this particular type of cable installation.

Improved Voltage Regulation

Aerial cable, because of its close geometric spacing as compared with open-wire circuits, has a lower reactance. Voltage drop is about half as great as typical crossarm construction. Similarly, for a given allowable voltage drop, power can be transmitted twice as far.

Storm Protection

You can reduce your storm maintenance costs due to the strength of preassembled aerial cable. Falling branches, or even trees, can be supported by the cable itself.

Other features of Rome's preassembled aerial cable include (a) practicality of mid-span tapping (because of reverse-lay construction); (b) improved appearance (elimination of pole crossarm hardware, in many cases); and (c) simplicity of installation.

Use Rome's preassembled aerial cable the next time you have to extend your power distribution lines. Your job will be easier and you'll save labor and maintenance expense. For more information on this product, call your nearest Rome Cable representative--or write to Department 770, Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION

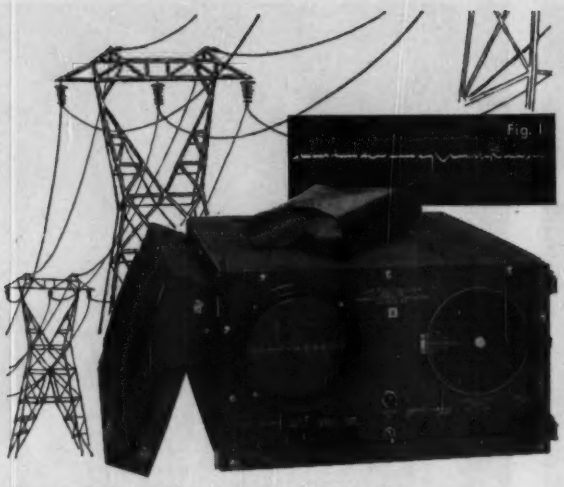


Figure 1. Display of 60 Kv line grounded at 27 miles.

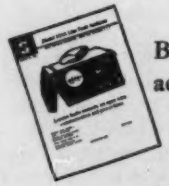
Locate circuit faults exactly ...½ to 200 miles distant

Communication and power lines
Use on any open wire line
Direct reading, simple to use
Use at carrier terminal, powerhouse, sub-station

Shorts, grounds or opens up to 200 miles away can be located within a few yards with the improved Sierra 124A Line Fault Analyzer. The instrument, operating on radar principles, sends a high amplitude pulse along the line under test. Discontinuities, even capacitors and transformer banks, appear clearly; a complete picture of the line and its condition appears on the radar-type "A" scope.

Two Pulse Widths

To insure maximum readability, two pulses — a 1 microsecond, 1,000 volt pulse or an 8 microsecond, 500 volt pulse —are provided. Other features include a sweep delay, movable distance step, sweep repetition rate of 60 cps and a high intensity flat faced cathode ray tube. Provision is made for camera attachment to the scope face.



Bulletin gives details, actual utility operating experiences

Data subject to change without notice.

Sierra Electronic Corporation
A subsidiary of Philco Corporation
4695W Bohannon Drive • DAvenport 6-2060
Menlo Park, California, U.S.A.
Sales representatives in Major Cities
Canada: Atlas Instrument Corp., Ltd., Toronto, Montreal, Vancouver, Winnipeg
Export: Frazar & Hansen, Ltd., San Francisco, New York, Los Angeles

Arizona Agreements

(*Continued from page* 83)

ciency. Alone, neither could afford large surplus capacity blocks.

• **Emergency assistance.** Either will, upon request, supply power needed to protect or restore service to firm power customers, if it is available. This is considered "interchange energy."

• **Transfer of power** to fringe-area customers. Energy transfer across the other party's system is provided for by a wheeling arrangement. Energy is delivered less wheeling losses. Charges are based on kwhr transferred.

• **Parker power interchange.** Both utilities buy from the U.S. equal amounts of Parker Dam power, normally delivered to each over the same lines to the same substation. Each is entitled to half the power available at any time. If power available to either is in excess of requirements, the other may buy the excess.

• **Interconnecting transmission** circuits. The Agreement states basic requirements for providing transmission networks and interconnection points adequate for power transfer, including that needed for outage of generation or transmission, or unavailability of purchased power. It also states responsibilities for additional circuit construction or compensation for overloading the other party's circuits. It also outlines formally a program for future transmission and interconnections.

Two permanent committees administer the Coordination Agreement. Composition, duties, and responsibilities of each are outlined in the contract.

The Coordinating committee, with one top-management member from each utility, establishes general policies for coordination of operation. It reviews prospective power requirements of the two systems, arranges for investigations, and makes recommendations on additional generating, transmission, and interconnection capacity and external power purchases. It also exercises general supervision and guidance over the Operating Committee.

The Operating Committee consists of two members from each

utility. Its job is making the Agreement work on a day-to-day basis. It establishes procedures and practices for interconnected operations, power delivery, energy and spinning reserve interchange, reciprocal emergency assistance, and similar matters. Its procedures determine costs, expenses, and energy losses of intersystem transactions, and set up the detailed metering arrangements required.

The principle of arbitration has been written into the Agreement as a means of settling disputes that cannot be resolved by the two committees.

GE Forms Service Group For Government Relations

A new government relations service group has been formed within the General Electric Co to help the manufacturing firm and its personnel get a working knowledge of the interaction of government and business.

It will also encourage public awareness of the ways in which sound government action can create an environment that lets business be of maximum service to the American people.

Organized as a part of the public and employee relations services, the new group will be responsible for: identification of general governmental trends; development of background information on public issue that affect business; and further development of political understanding within the company.

The new component is not a government liaison activity, the company emphasized, nor is it concerned with the sales of GE products to the government. It will, however, explore where and how the company can make greater contributions "to the effective working of the democratic governmental process," J. S. Parker, vice president of GE's public relations services, said.

Hoyt P. Steel, former president of Benjamin Electric Mfg Co. of Des Plaines, Ill., will head the government relations group. A 48-year old MIT graduate, Steel joined GE last November. He had been with the Illinois firm 28 years.

EVERYTHING DEPENDS ON THE POLE

Installations worth thousands of dollars in equipment and labor are often supported by a single pole. Considering the great expense of any equipment installation today, it would be false economy to ever use inferior poles. This is especially true when you remember a difference in quality can be great while the difference in pole price is always small.

One way to assure finest quality poles at lowest possible price is to specify Bell Poles. They are all selected from Bell's own timber lands and precisioned processed to your specification. Every pole is backed by Bell's 50 years experience in the pole business and an honest desire to supply better poles to the industry.

We'll appreciate an opportunity to bid on your pole requirements. Write, wire, or telephone Bell Lumber and Pole Co., Midland Bank Building, Minneapolis, Minnesota.

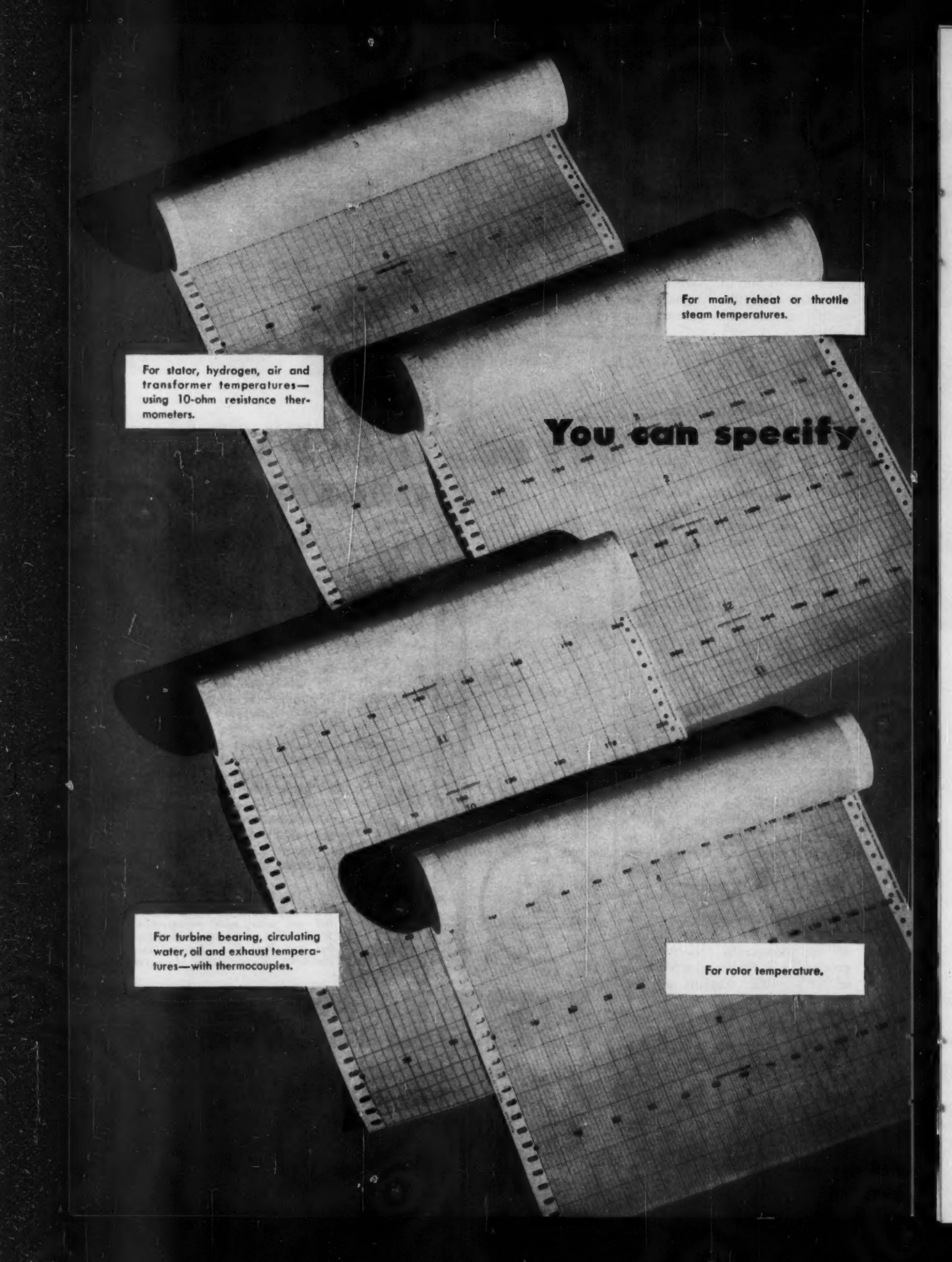
Since 1909

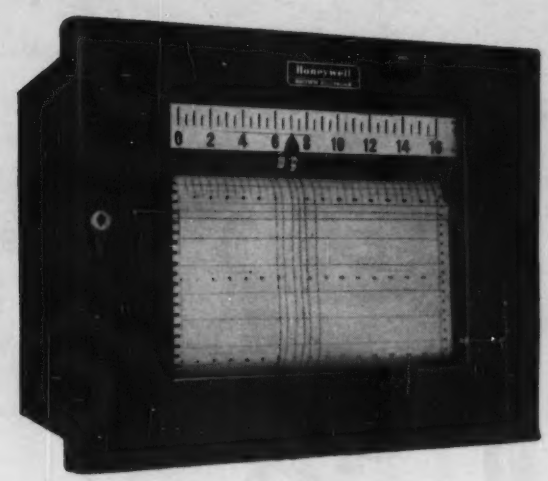
BELL LUMBER AND POLE COMPANY

NEW BRIGHTON, MINN. — LUMBY, CANADA

MIDLAND BANK BUILDING

MINNEAPOLIS, MINNESOTA


For main, reheat or throttle steam temperatures.
For stator, hydrogen, air and transformer temperatures—using 10-ohm resistance thermometers.
You can specify
For turbine bearing, circulating water, oil and exhaust temperatures—with thermocouples.
For rotor temperature.



ElectroniK strip chart recorders can be supplied for power plant use with scores of different temperature calibrations. Some of the typical standard charts are shown on the opposite page. Actual chart size is 11 inches in calibrated width.

an *ElectroniK* recorder

. . . for any of your temperature measurements

LET *ElectroniK* recorders keep constant watch over your plant temperatures—accurately, efficiently.

Choose one *ElectroniK* instrument to record a single temperature, or another to combine as many as twenty temperature records on a single chart. When several temperatures are combined on one chart, correlation is simple . . . operators can keep close check on trends . . . engineers can analyze operation in accurate detail.

Built-in circuits adapt these recorders for signalling excess temperatures. And there's a complete Honeywell line of thermocouples, extension wires, and power-plant-type resistance thermometers to work with *ElectroniK* instruments.

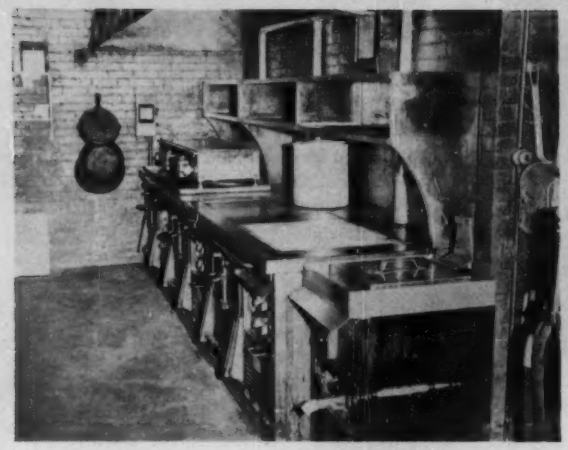
ElectroniK instruments are famous for their stamina and dependability. For a discussion of how they can be applied to measuring your plant temperatures, call your local Honeywell field engineer. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

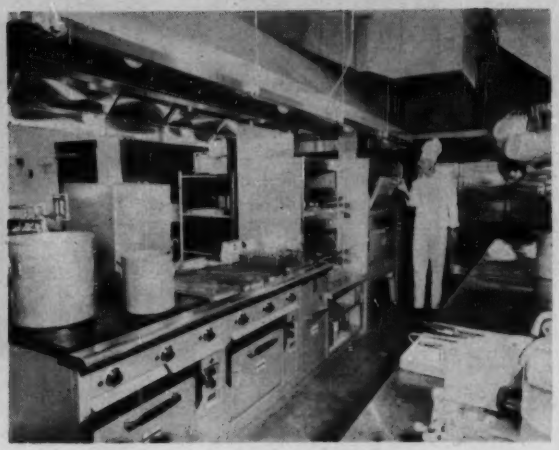
● **REFERENCE DATA: Write for Bulletin 9070, "Instruments for Electrical Power Generation."**

Honeywell

First in Controls



These 20-year old electric ranges . . .



are retired by a new generation, as . . .

School Gives Electric Kitchen a Facelifting

The Westover School, Middlebury, Conn., recently gave its 20-yr old electric kitchen a facelifting.

Three veteran ranges and a deep fat fryer were replaced with 113 kw of new cooking, frying and baking equipment. Here's the breakdown:

Ranges with ovens—42 kw
Double broiler—24 kw
Fryer—12 kw
Roasting and baking oven—12.4 kw
Three-section baking oven—18.6 kw
Hot plate—4.1 kw.

This equipment enables Westover to turn out 675 hot meals a day.

What is the case for electric cooking equipment in schools? Westover's 20 years' experience speaks eloquently enough. Said one Connecticut Light & Power Co representative, whose lines the school is on, "The school authorities and personnel using the equipment are happy with their decision to stick to electric, and are completely satisfied with the new installation."

KU Finds New Store Fronts Mean More Commercial Kwhrs

Kentucky Utilities Co has developed a Main Street Modernization program, aimed at modernizing and improving the cities, towns and business districts in its service area.

The program, designed to dress up the store fronts, interiors, parking facilities, traffic flow and street lighting, has racked up a total of 71 new store fronts in the first three months of 1958.

Main tool of the program is a slide presentation for civic groups. The "before" and "after" method is used in these slides, showing the changes in a building or series of buildings after they have been remodelled. The slides were prepared by Kentucky Utilities, the Kentucky C of C, and other organizations interested in the area's betterment. The utility backs up the presentation by its 16 commercial service advisers, who actively promote it, in addition to their other duties.

KU feels the time and effort spent on the program is worthwhile, and beneficial to the load-building.

COMPETITOR'S CORNER

AGA Sees Appliance Sales at 57 million for 1958-62

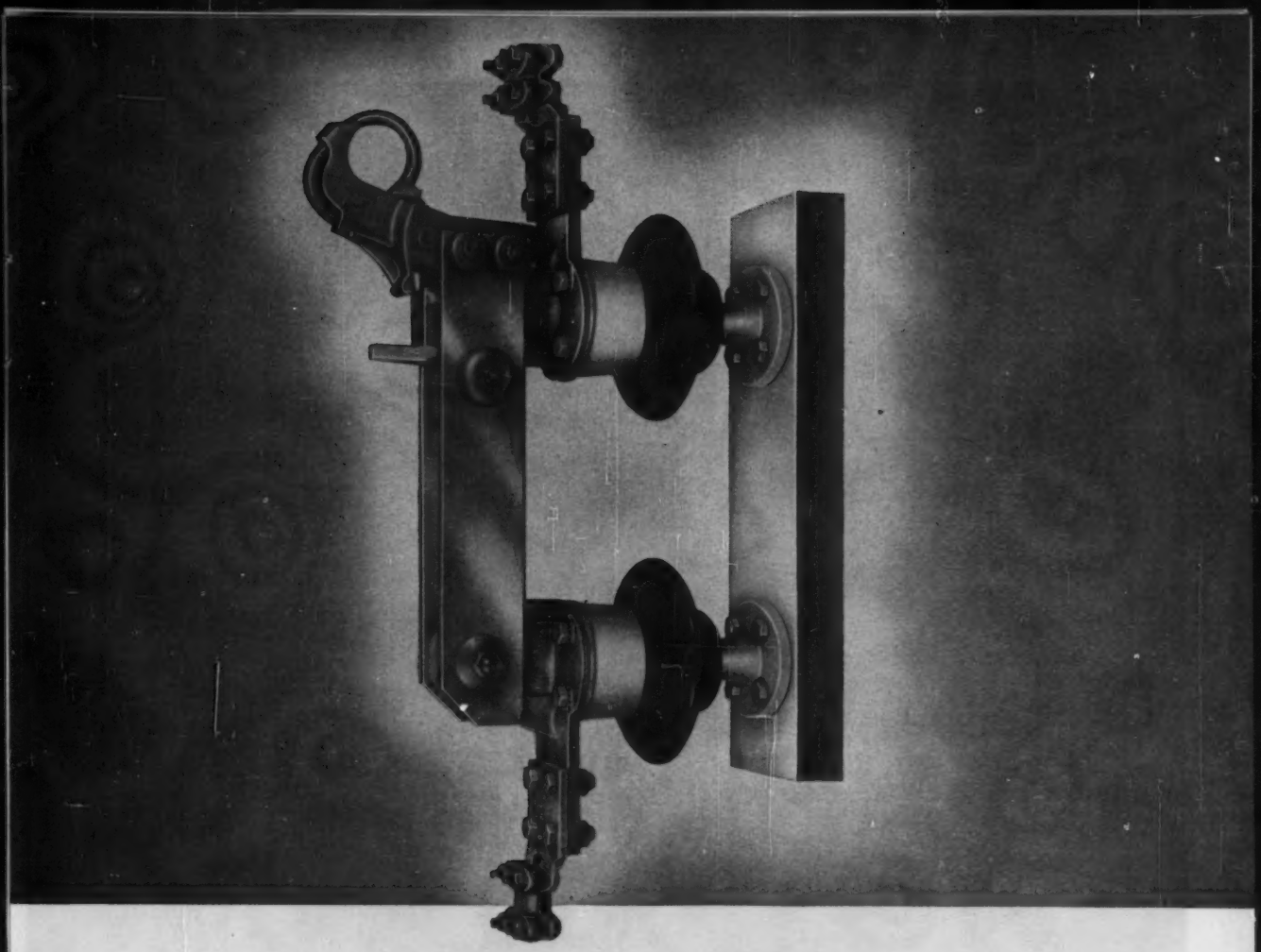
The residential market for gas appliances and equipment can account for sales of more than 57 million units in the next five years. This is the estimate of American Gas Association's Bureau of Statistics, published in a recent issue of *Gas Age*.

Sales in 1958 can reach 9.6 million units; this is 1.9 million units higher than in '57. These figures, for the 1958-62 period, include units for new construction and replacement. Here's the way the appliance and equipment breakdown looks:

- 13.9 million kitchen ranges
- 17.7 million water heaters
- 13.0 million space heaters
- 5.5 million central heating units
- 3.7 million clothes dryers
- 2.9 million floor and wall heaters
- 0.5 million incinerators.

No predictions were made for air conditioners or heat pumps.

(*More Selling on page* 184)



There is an Important Difference in this Southern States Disconnect

TYPE PBO-R

This regulator by-pass switch offers a compact unit that provides disconnecting means needed to by-pass and isolate voltage regulators. Available in ratings of 7.5 — 15 kv — 400, 600, and 1200 amps.

All hookstick-operated disconnects are simple devices. There are no intricate mechanisms — nothing complicated in their design or construction.

Certain highly desired features are fairly well standardized on disconnects being marketed today: positive latching of the blade in its closed position; a blade pryout; guides to position the blade when closing; and high pressure line contacts.

Yet there is an important difference in disconnects!

You can't see it feature by feature. It is apparent only when you take a good, studious look at the complete unit. For then you see how all of the features blend together to give you a sturdy, rugged and highly dependable piece of equipment.

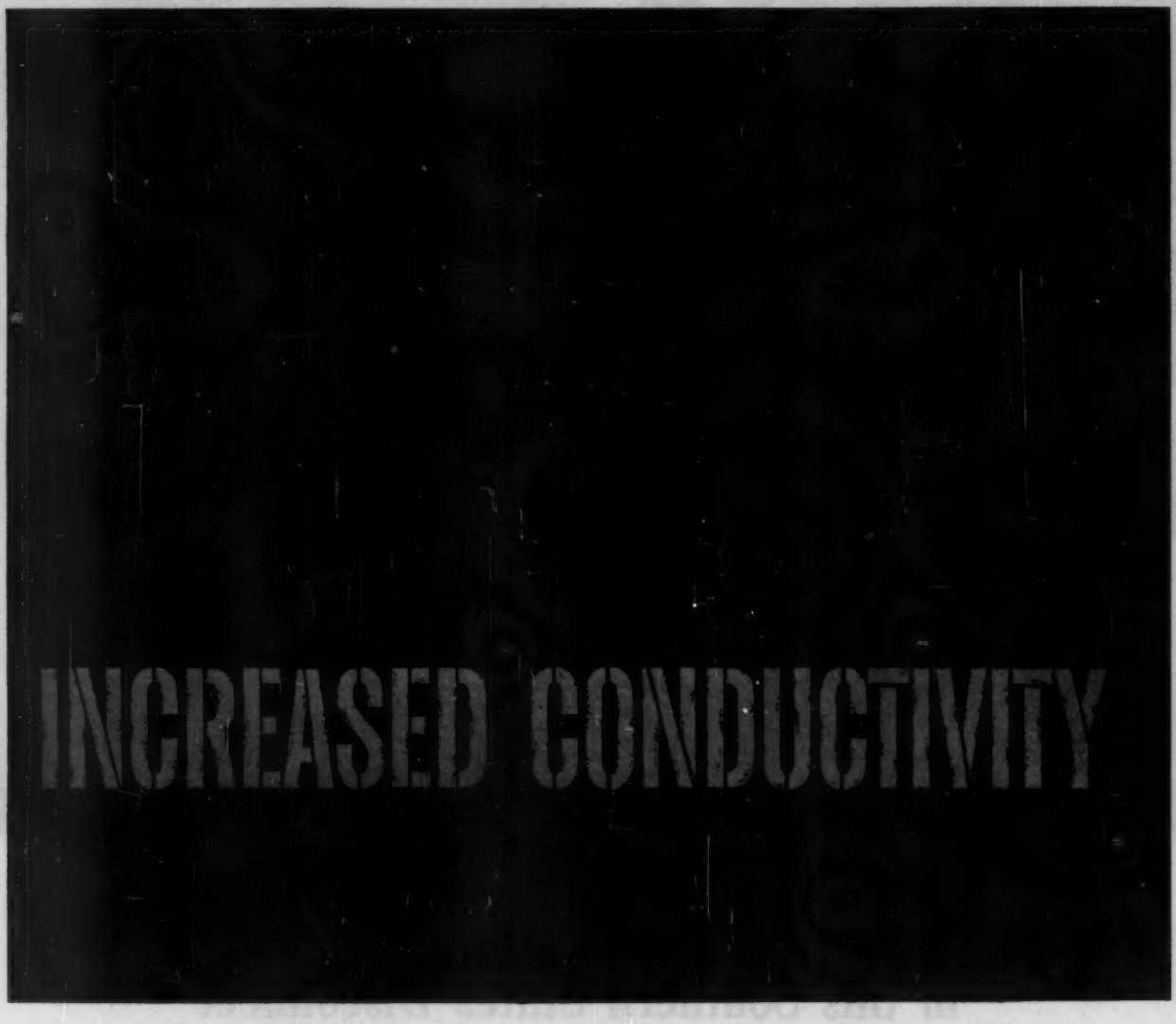
Take a look at the Southern States PBO Disconnect illustrated above and you'll see what we mean.

For the full story, see your Southern States representative, or write for Bulletin 55 PBO.

LIVE BETTER ELECTRICALLY

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto



SAVE $13.30 PER CONDUCTOR MILE PER YEAR WITH NEW ALCOA 62% CONDUCTIVITY CONDUCTOR

Here's How:

Conductor size: 795,000 cm ACSR 26/7
Weight per foot: 1.094 lbs
Peak load current: 500 amps
Demand charge: $200 per kw (average for company with both hydro and steam generation)
Annual cost of demand charge: 11%
Cost of energy losses: $0.0035 per kwh
Load factor: 50%
Loss constant: 2650 (Fig. 13-1, p. 1159, Standard Handbook for Electrical Engineers, 9th Ed.)
Operating temperature: 50° C
Interest rate: 4%
Amortization period: 30 years
Resistance per conductor mile, 61% conductivity: 0.1297 ohms
Resistance per conductor mile, 62% conductivity: 0.1280 ohms
Power loss per conductor mile for 61% conductivity:
$P_L = I^2 r_a = 500^2 \times .1297 = 32.43$ kw
Annual cost of demand charge per conductor mile:
$C_D = 32.43 \times \$200 \times .11 = \$713.46$
Annual energy loss per conductor mile:
$32.43 \times 2650 = 85{,}940$ kwh
Annual cost of energy losses per conductor mile:
$C_e = 85{,}940 \times \$0.0035 = \$300.79$

Total annual loss charges per conductor mile:	$713.46
	300.79
	$1,014.25

For 62% conductivity, annual loss charges per conductor mile are $1,000.95.
The annual saving between the two is $13.30 per conductor mile.
The present value of benefits is:

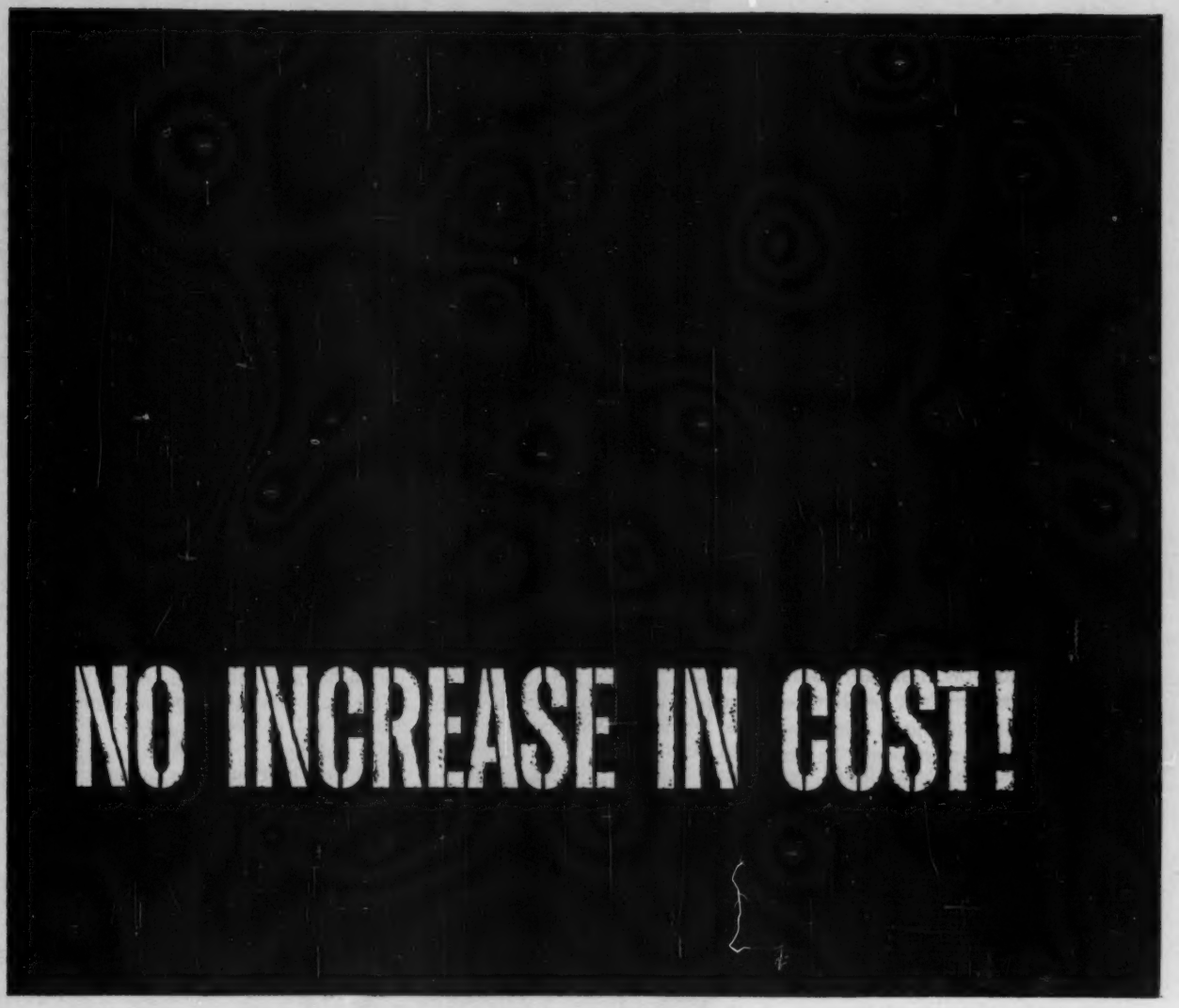
$$PV = C\frac{1-(1+r)^{-n}}{r}$$

$$= \$13.30 \times \frac{1-(1+.04)^{-30}}{.04} = \$229.96$$

Converted to per-pound value of conductor:

$$\frac{\$229.96}{5280 \times 1.094} = \$0.0398 \text{ per pound of conductor}$$

Note: This example is designed to show typical costs. Cost factors will, of course, vary for your area, resulting in smaller—or even greater—savings.



Here's Why:

Alcoa's new electrical conductor standard with minimum guaranteed conductivity of 62% IACS (International Annealed Copper Standard) can save you money *right now.*

This remarkable new Alcoa development in electrical technology gives you an increase in conductivity at no increase in cost over EC grades of conductor formerly supplied. Extensive shipments have already demonstrated the complete dependability of this new Alcoa high conductivity guarantee. If you *must* consider other sources for *either* transmission or distribution, ask for certified test reports.

This new conductor is the latest example of Alcoa's leadership in research and development which for over half a century has produced increasingly efficient conductors and accessories for the nation's electric utilities. For more information on how Alcoa 62% conductivity conductor can result in savings on *your* system, call Alcoa. Aluminum Company of America, 2306-F Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM
ELECTRICAL CONDUCTORS AND ACCESSORIES
ALUMINUM COMPANY OF AMERICA

Your Guide to the Best in Aluminum Value

"ALCOA THEATRE"
EXCITING ADVENTURE
ALTERNATE MONDAY EVENINGS

Cutting glare in assembly area . . .

and reducing errors in office . . .

Tailored Lighting Spurs Efficiency, Output

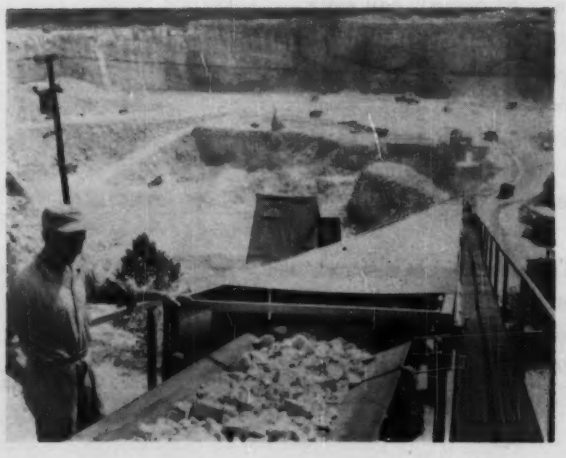
ROBERT L. GORDON, Industrial Power Engineer, West Penn Power Co, Greensburg, Pa.

A new lighting system tailored to meet lighting needs for each work area has reduced errors, stepped up efficiency, and enabled employees to produce more in the remodeled plant of the Pittsburgh Reflector Co, in Irwin, Pa. Providing high level, evenly distributed lighting, it reduces clerical errors in the offices, cuts glare in the assembly areas, and eliminates the high contrast between lighted and unlighted areas in the shipping room.

In the 175 x 140-ft fixture assembly area, where glare from the high-gloss white enamel finish on the metal fixtures could easily cause efficiency-sapping eyestrain, semi-direct, industrial type units with reflectors are used. A minimum of 60 ft-c is maintained in all parts of the room. The 120 fixtures, each with four 40-watt lamps, are mounted 18 ft above the working area.

In the shipping office, costly clerical errors which disrupt production and shipping schedules are prevented by the new lighting. Five continuous rows of two-lamp, louvered fluorescent units, mounted on 7-ft centers 100 inches above the floor, maintain an 80 ft-c on the desk tops and complement the colors on the ceiling, walls and floor.

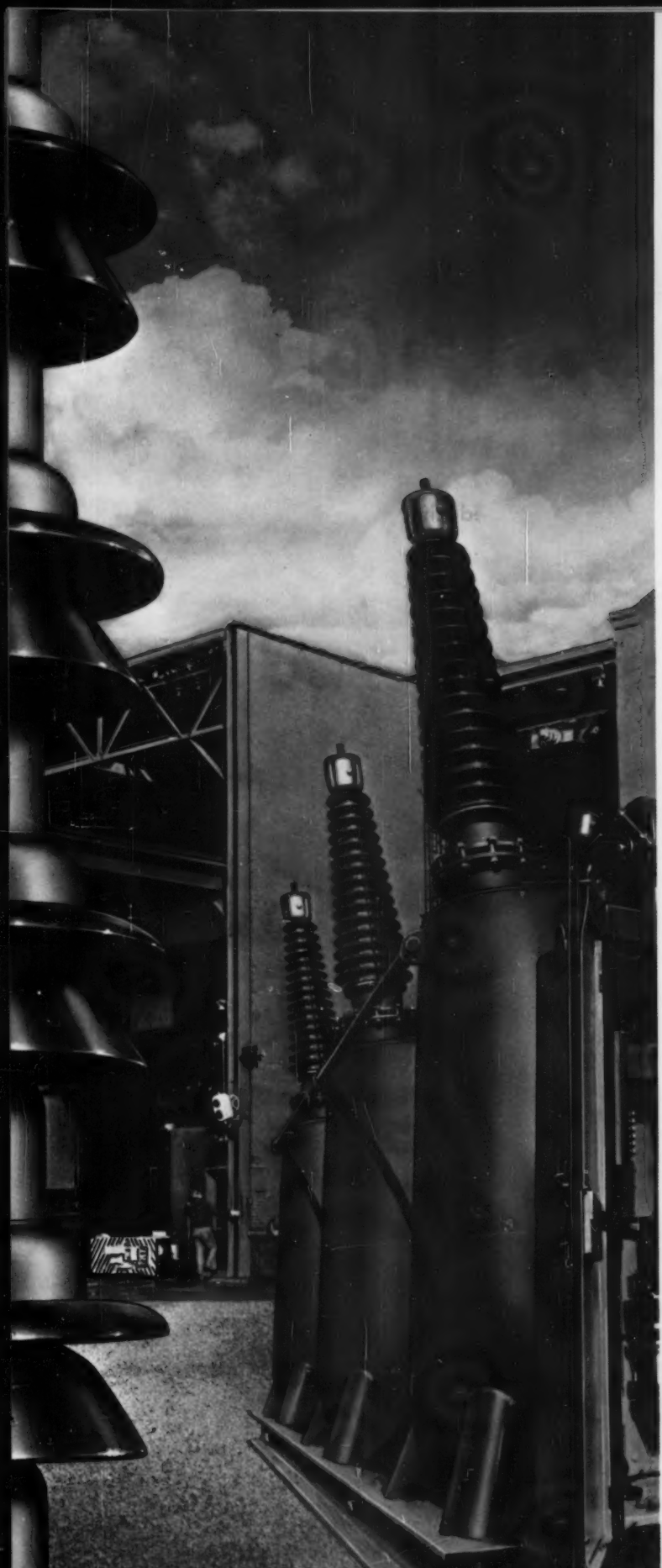
Shipping instructions are easier to read and good housekeeping is assured with 35 semi-direct, fluorescent units used in the 70 x 45-ft shipping area. Six continuous rows of two-lamp units, suspended 14 ft above the floor, permit stacking of packing cases without affecting the light pattern. These fixtures direct some light toward the upper area of the bay, to reduce the sharp, eye-tiring contrasts between the lighted and totally unlighted areas.



Quarry Finds Electric Belt Conveyor Economical

J. A. DEVEREUX, Industrial Sales Engineer, Baltimore Gas & Electric Co., Baltimore, Md.

An 800-ft belt conveyor which carries crushed rock 250 ft from quarry floors to electrically operated classifying machinery has saved time, money, and manpower at the Texas, Md, quarry of Harry T. Campbell Sons Corp. Travelling 250 fpm, it assures fast continuous delivery and is far more economical than using trucks. The conveyor is operated by a 300-hp motor. After the rock is graded, it is carried to storage by another 75-hp electric belt conveyor. Both motors operate from a 480-v line



3 million faults... just to prove a point!

WESTINGHOUSE HIGH POWER LAB
IS PROVIDED THROUGH
PLOWBACK
OF EARNINGS INTO RESEARCH

In the 33 years of Westinghouse High Power Lab operation, well over three million deliberate faults have been created to assure our utility customers that they can be *sure* when they buy Westinghouse protective equipment. We *know* the devices will interrupt rated fault currents . . . not from engineering theory alone, but from actual performance under fault conditions the equipment will encounter on your system.

Westinghouse was the first to see the need for this basic proving ground. It has been instrumental in developing many new devices for utilities that have meant greater system stability and continuity. The millions of dollars plowed back into this facility have produced such significant advances as De-ion® Grids, DH Breakers, Compressed Air Breakers and many others.

With the growing voltages on systems today, it is highly impractical to test such protective devices as power circuit breakers on your own system. At the High Power Lab, equipment rated up to 25,000 mva can be tested at any time, and tests up to 345,000 amperes torture equipment to provide the progress to meet tomorrow's system needs.

YOU CAN BE **SURE**... IF IT'S

Westinghouse

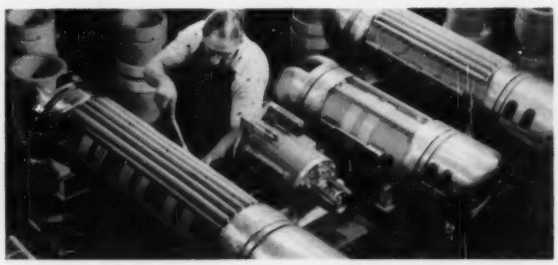
From its very inception in 1929, the Westinghouse De-ion grid has proven capable of interrupting ever-bigger faults by refining and extending the basic design. The familiar multi-break tubular grid, for instance, was designed with four breaks to interrupt faults of 25,000 mva at 345 kv. By adding additional breaks in series, increased interrupting capacities at much higher voltages can be obtained. Such a history of proven capabilities indicates that the sky is the limit so far as eventual capacity is concerned.

440 kv is just around the corner at the Westinghouse High Power Lab

WATCHCASE DESIGN MEETS CHALLENGE FOR INCREASED CAPACITY IN LESS SPACE

Ever anticipating the growing needs of the electrical utility industry, Westinghouse has long been a pioneer in developing equipment before it is actually required. Right now in the labs at East Pittsburgh, Westinghouse engineers are developing circuit breaker components to handle the gargantuan faults possible with transmission lines carrying 440,000 volts. They'll be ready when the industry moves to the next big hurdle in high-voltage transmission.

The fundamental soundness of Dr. Joseph Slepian's De-ionization Theory has been proven over and over again at the Westinghouse High Power Lab as engineers have extended the capacity of breakers, decreased interrupting times and minimized reclosing periods. Here are some of the important industry dividends of the Westinghouse policy of Plowback of Earnings into research:



DE-ION GRIDS PROVED STEPPING STONES TO TOMORROW'S SUPER VOLTAGES

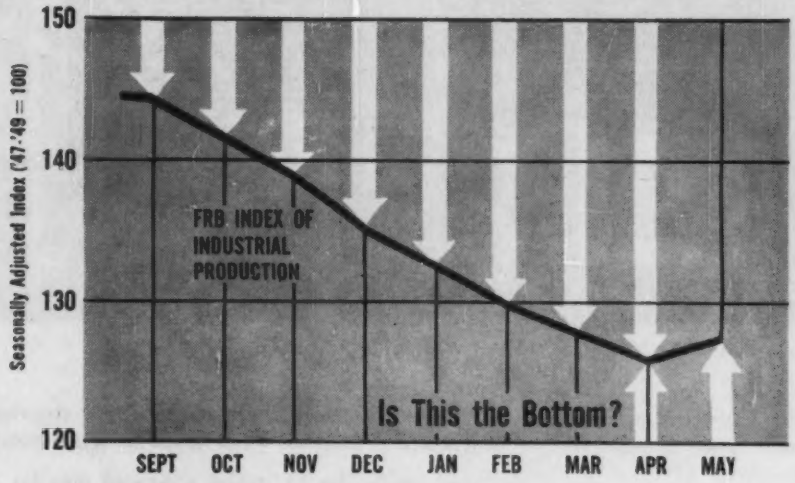
Westinghouse solved two big problems with the engineering of the Watchcase* tank: greatly reduced foundation shock of fault interruption; and substantial saving in oil capacity required. The curved shape of the tank bottom equalizes the compression forces over a big area . . . thus cushioning the shock. Careful research and engineering—backed by testing in the High Power Lab—produced the minimum electrical clearance for safe interruption in the tanks. Results: important savings in oil required and the over-all size of tank, pointing the way to higher voltages and greater interrupting capacities.

*Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse

JI-97230-2

Report on
Electrical
Business Outlook



The Economy: Upturn in Making

The most encouraging signs since the recession began have accumulated in the past few weeks. Hopeful reports have flowed in from many sectors of the economy: Homebuilding, the steel rate, unemployment, business sales and inventories, personal income, and the output of electric utilities are a few of the indicators signaling that the recession is at or near its ebb.

Strongest evidence of all came with last week's disclosure that the Federal Reserve Board's seasonally adjusted index of industrial production had snapped an eight-month losing streak with a one-point gain in May. Since industrial production is one of the best measures of the state of the economy, May's gain shows the economy's slide has been stopped—at least temporarily.

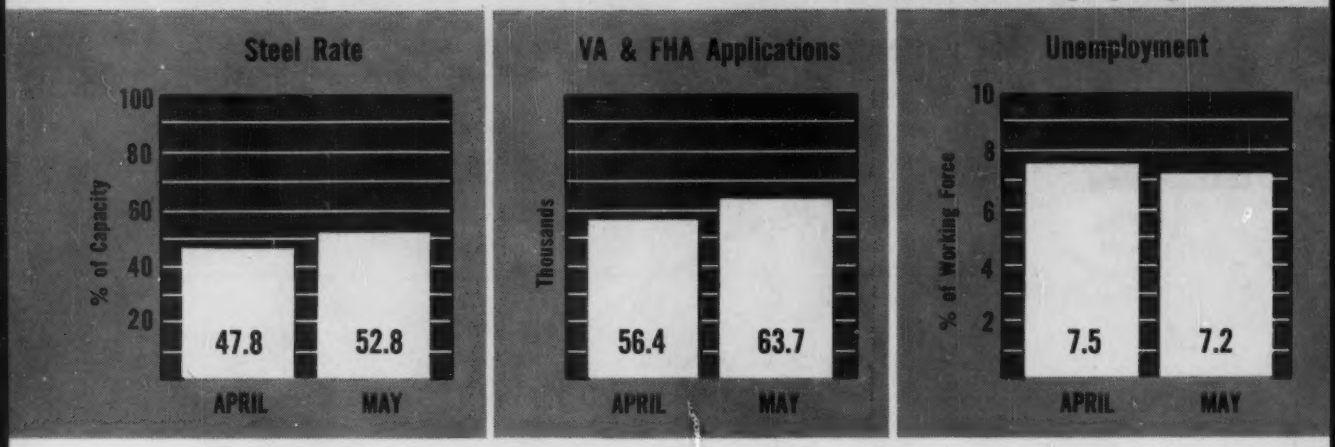
Not all the indicators are encouraging. Capital expenditures by business and durable goods purchases by consumers are the stuff that booms are made of, and there's no sign of marked improvement in either of these vital sectors.

Business spending for new plant and equipment may be off even more than was anticipated a few months ago. A recent report from Dept of Commerce—Securities & Exchange Commission put '58 outlays at $30.8 billion instead of the $32.1 billion previously forecast. The '57 total was $37 billion. Electric utilities alone plan to spend more this year than last—by 5%.

In the durable goods sector, consumers have kept a tight grip on their wallets. Although total consumer spending has tailed off only 1% since last August, spending on durables has tumbled 10%. The biggest and most expensive durable—the automobile—has been the hardest hit. There has been some increase in new car sales recently, but the industry will be lucky to sell 4.5 million cars this year—compared to 6 million in '56 and '57, and 7 million in 1955.

Industrial production may dip again during the summer. For example: the key automobile industry may have longer than normal summer shutdowns this year. But the sum total of many indicators gives concrete evidence that the economy

Here Are Some Encouraging Signs from



will not drift much lower and moderate recovery will be underway before the year is out. Here are a few of the signs that point to that conclusion:

Steel production has taken a decided turn for the better in recent weeks. In late April and early May, the steel industry was operating at less than 50% of capacity. May's rate averaged 52.8%, and this month it has been moving along at above 60% of capacity. A word of caution: Part of the pickup may be laid to speculative buying by steel users trying to beat the rise in steel prices expected early next month.

The improvement in homebuilding can be accepted without reservations. Private housing starts exceeded a million-a-year pace in May for the first time since January. The May figure of 1.01 million is a 25% jump from the March low of 800,000 and marks the second consecutive monthly improvement.

And other housing statistics indicate that homebuilding should continue to pick up throughout 1958 and on into 1959. Applications for government-backed mortgages have advanced steadily this year, and in May applications for Federal Housing Administration committments and requests for Veterans Administration appraisals totaled 63,700—nearly double the '57 high.

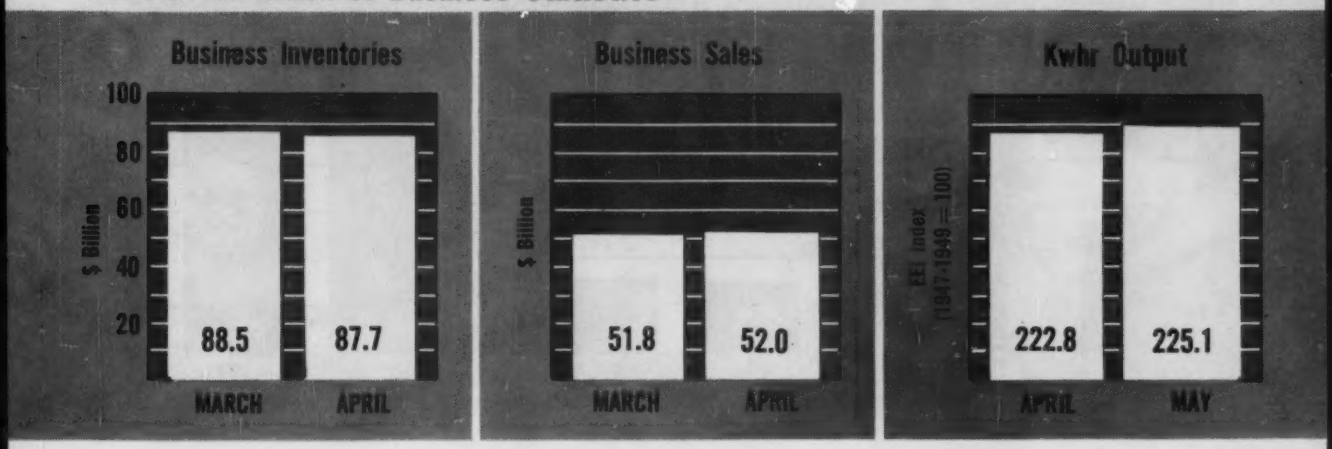
May job figures were encouraging. Unemployment fell below 5 million and employment rose from just under 63 million in April to just over 64 million in May. The percentage of the working force unemployed fell from 7.5% in April to 7.2% in May—the first such decline since the recession began.

But don't expect too much encouragement from job figures for the next few months, despite the moderate improvement in economic activity anticipated. For one thing, this month the flood of school graduates entering the work force will certainly swell the unemployment total some 700,000 to 800,000. And don't forget that production can be stepped up considerably by lengthening the work week of workers already employed. For the whole year, it's unlikely that average unemployment will drop below 5 million.

Personal income rose in May by $1.2 million. The figure has been edging up since February, but the May increase is particularly noteworthy in that wage and salary payments rose for the first time since last summer, showing a definite pickup in business activity.

Business sales and inventory figures may be the most encouraging of the lot. In April (the latest month for which figures are available), businessmen con-

the Current Batch of Business Statistics



tinued to work down their stocks. At the same time, total business sales gained for the first time in many months—thus lowering the ratio of inventories to sales. Manufacturing sales continued to decline, but here the stocks/sales ratio improved for the first time since the recession began, as inventories fell more sharply than sales.

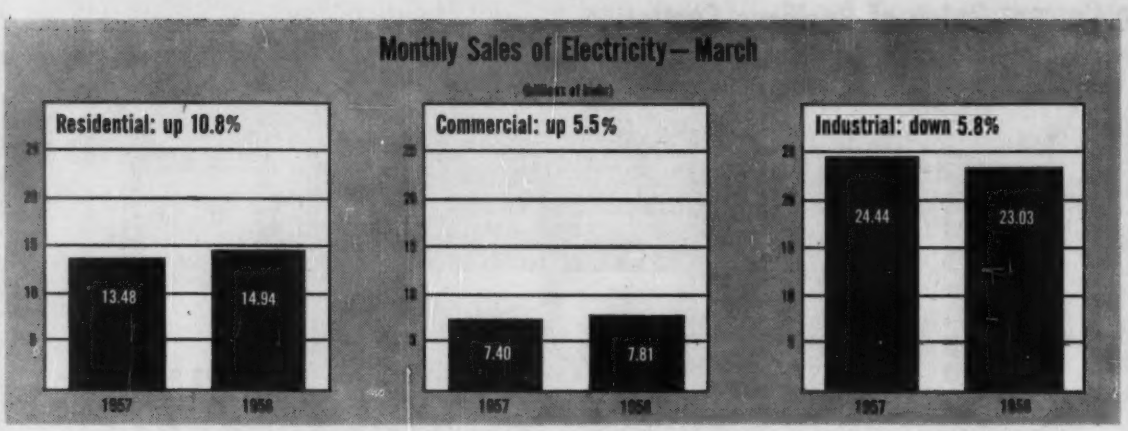
The ratio between inventories and sales still remains high, and businessmen will doubtless keep liquidating stocks for several months to come. But it is very likely that inventory liquidation will now proceed at a reduced rate. And, with final demand holding up well, even a reduced rate of inventory rundown will mean greater production and more jobs. How important inventory reductions have been in this recession shows up in this fact: From the third quarter of 1957 to the first quarter of 1958, gross national product fell $18 billion. No less than $12 billion of the drop was in inventory changes.

The composition of inventories could help speed a business upturn. Most of the inventory cuts have been in purchased materials and goods in process, with finished goods stocks remaining high. This means that a rise in new orders for finished goods might catch businessmen short on goods in process and purchased materials, and require them to start buying raw materials and stepping up production schedules in a hurry.

What all this means to electric utilities shows up to some extent in the output figures for May, which showed a greater than seasonal rise over April. Edison Electric Institute's seasonally adjusted index jumped two points last month, and June output has so far shown a similar rising trend.

Residential and commercial sales of electricity have held up well—latest figures (March) show residential sales running almost 11% above year-ago levels. The only drag has been industrial sales, and the worst may be over for that sector of the electrical business. Any improvement in industrial production will show up in the kwhr sales figures.

The recession is not over, but business is not likely to slip much lower from here on. The pickup in homebuilding, a slower rate of inventory reduction, plus increased government spending and a continued high level of consumer spending are arresting the decline, and should produce a moderate improvement in the health of the economy in the last half of this year. Recovery could begin in earnest in the last quarter. In other words, the patient has rallied—but may be in for a fairly long period of convalescence.



Power Statistics . . .

		Latest Month	Year Ago	Annual Change %
Capacity	Mar.	130.36	121.78	7.0
Peak—Class I Systems, million kw	Dec.	107.1	102.4	4.6
Estimated Dec. '58 Peak	Mar.	118.7	122.5	− 3.1
Production—billion kwhr	Mar.	52.62	52.45	0.3
Hydro		12.71	11.44	11.1
Fuel		39.91	41.01	− 2.7
Sales—billion kwhr	Mar.	48.28	47.80	1.0
Residential		14.94	13.48	10.8
Commercial		7.81	7.40	5.5
Industrial		23.03	24.44	− 5.8
Other		2.50	2.47	1.2
Fuel Consumption	Mar.			
Coal—million tons		13.38	13.84	− 3.3
Oil—million barrels		5.95	6.57	− 9.4
Gas—billion cu ft		87.89	93.15	− 5.6
Net Income Class A & B Co's—$ million	April	124.28	116.86	6.3
Residential Customers—millions	12 mos.	46.91	45.92	2.2
Revenue per kwhr	ended	2.55¢	2.59¢	− 1.5
Avg kwhr per customer	Feb. 28	3,219	3,004	7.2
Avg annual bill		$82.08	$77.80	5.5

Business Statistics . . .

Indexes: 1947–49 = 100				
FRB Industrial Production	May	127	143	−11.2
ENR Construction Cost	June	158.8	151.2	5.0
BLS Cost-of-living	April	123.5	119.3	3.5
New Orders for Machinery (1950 = 100)	April	135	145	− 6.9
NEMA Sales				
Insulation materials	April	107	145	−26.2
Electric appliances		75	83	− 9.6
Wholesale prices				
Motors and generators	Mar.	143.8	140.7	2.2
Transformers and regulators		147.6	147.4	0.1
Switchgear and fuses		172.7	164.4	5.0
GNP—annual rate—$ billion	1st qtr.	422.0	429.9	− 1.8

Significant changes: McGraw Hill's new orders index, running 6.9% behind last April, climbed closer to year-ago levels than it has since last September.

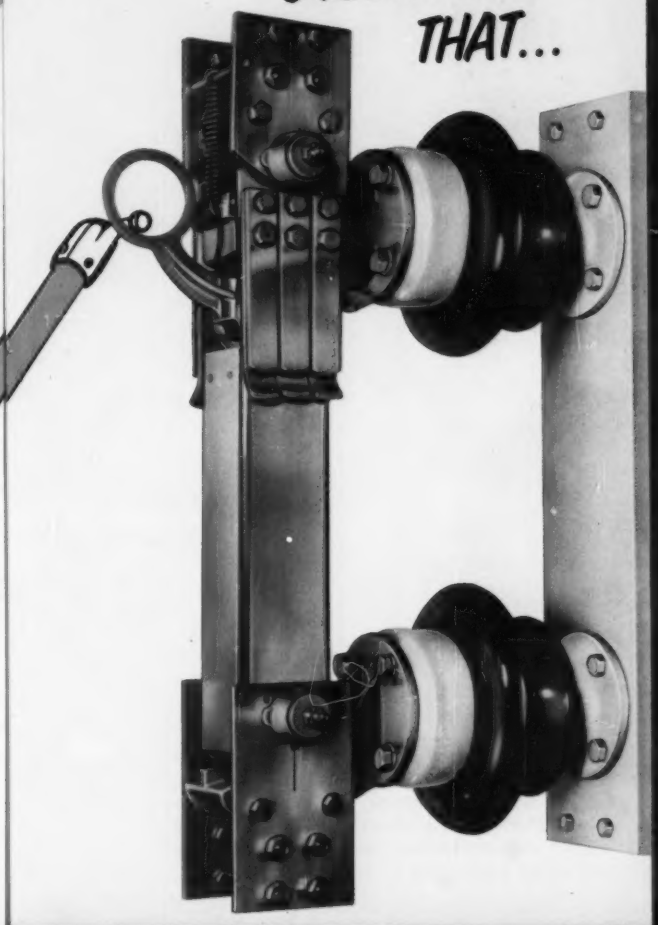
CHANCE BTH HIGH-CAPACITY DISCONNECTS

...NOW IN 3000 AMP RATING

Here's an outstanding development in power switching equipment! The Chance Type BTH is a high-current disconnect that combines rugged construction with easy, positive operation. Now, the same operating and performance advantages of the 2000 Amp BTH are available in a 3000 Amp design.

The BTH meets all applicable AIEE and NEMA requirements. The 2000 Amp rating is available in voltage ratings from 7.5 to 46 KV; the 3000 Amp in ratings from 7.5 to 23 KV.

A NEW 3,000 AMP DISCONNECT THAT...



...OPENS WITH A SINGLE PULL!

TOGGLE-JAW ACTION MAKES IT EASY TO APPLY HIGH PRESSURE

A single pull with a hook stick relieves the contact pressure smoothly and easily, permitting the operator to open the blade with a steady pull. A single push swings the jaw into the straight-line closed position, gradually applying higher pressure to the blade as it closes.

This heavy duty disconnect gives new ease of operation in switching high-current circuits. High contact pressure is applied and relieved by the toggle-action of the jaw—minimizing operating effort.

This toggle-jaw action, plus the single blade operation, gives the operator positive control of the switch. In isolating, *one* pull disconnects the line completely—*one* closing and the switch is in *full* operating capacity.

A. B. CHANCE CO.

CHANCE BTH HIGH-CAPACITY DISCONNECTS

...NOW IN 3000 AMP RATING

Here's an outstanding development in power switching equipment! The Chance Type BTH is a high-current disconnect that combines rugged construction with easy, positive operation. Now, the same operating and performance advantages of the 2000 Amp BTH are available in a 3000 Amp design.

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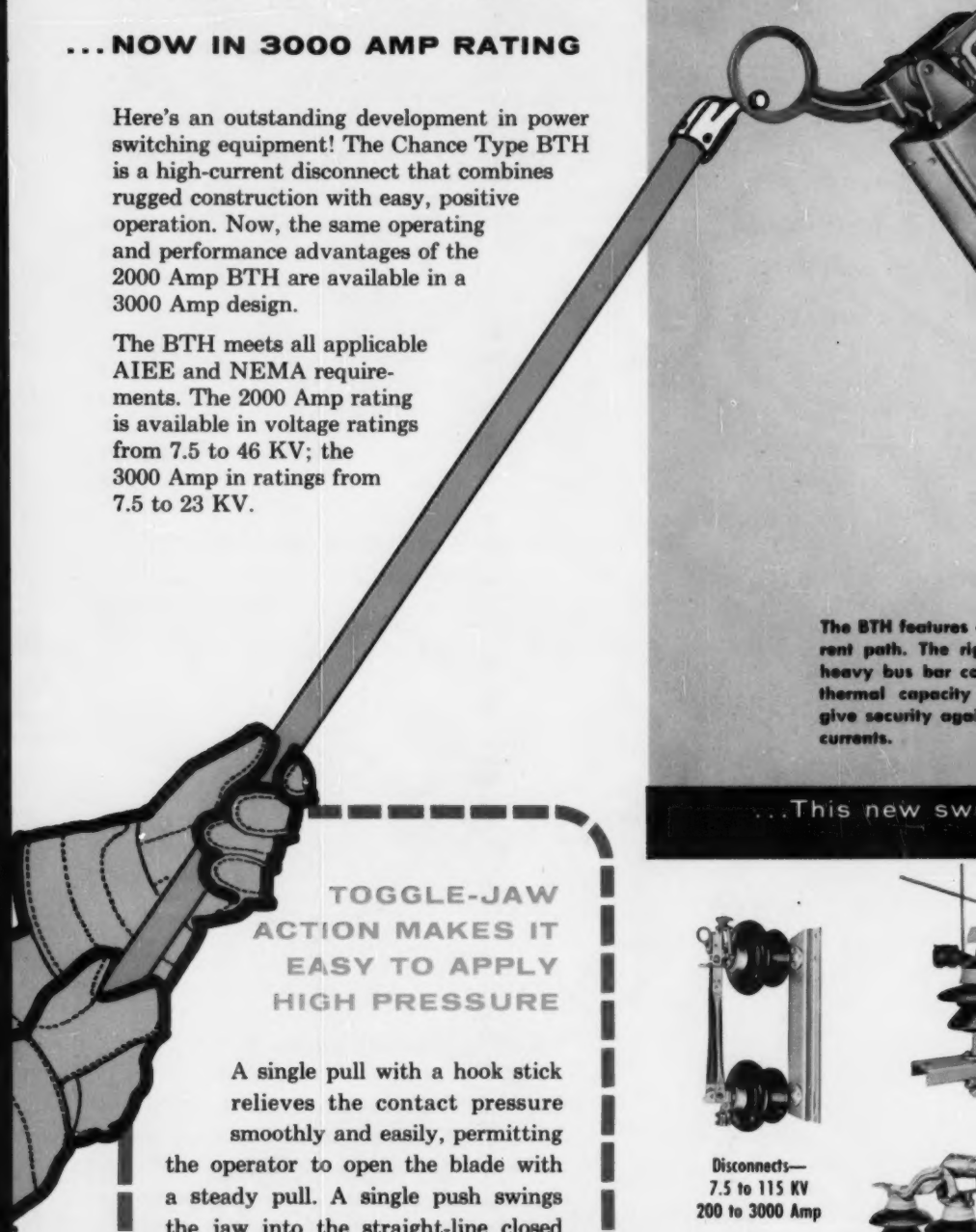


The BTH features
rent path. The ri
heavy bus bar co
thermal capacity
give security aga
currents.

...This new sw

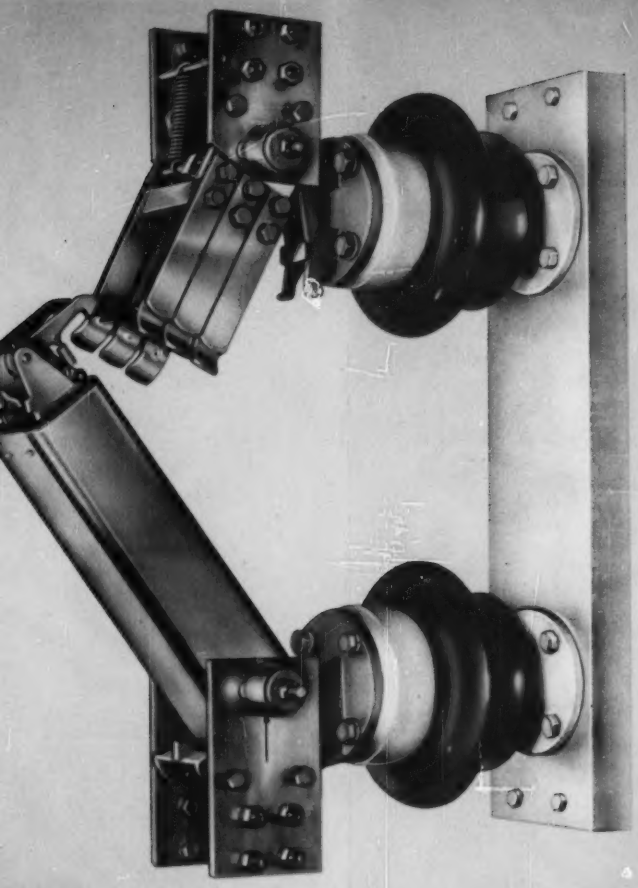
TOGGLE-JAW ACTION MAKES IT EASY TO APPLY HIGH PRESSURE

A single pull with a hook stick relieves the contact pressure smoothly and easily, permitting the operator to open the blade with a steady pull. A single push swings the jaw into the straight-line closed position, gradually applying higher pressure to the blade as it closes.

Disconnects—
7.5 to 115 KV
200 to 3000 Amp

Vertical Break—7.5 to 230 KV
400 to 2000 Amp

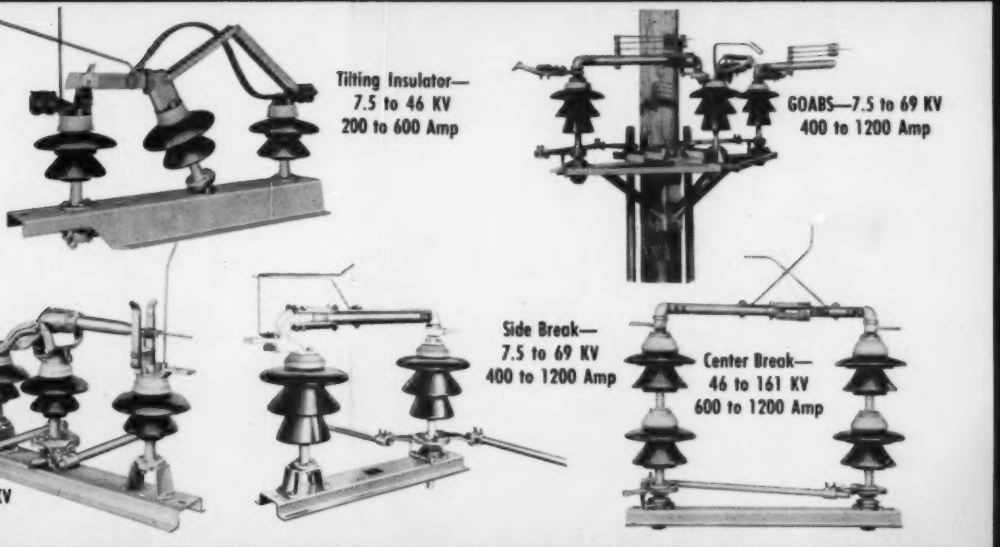
...you get the
for 200 Amp c



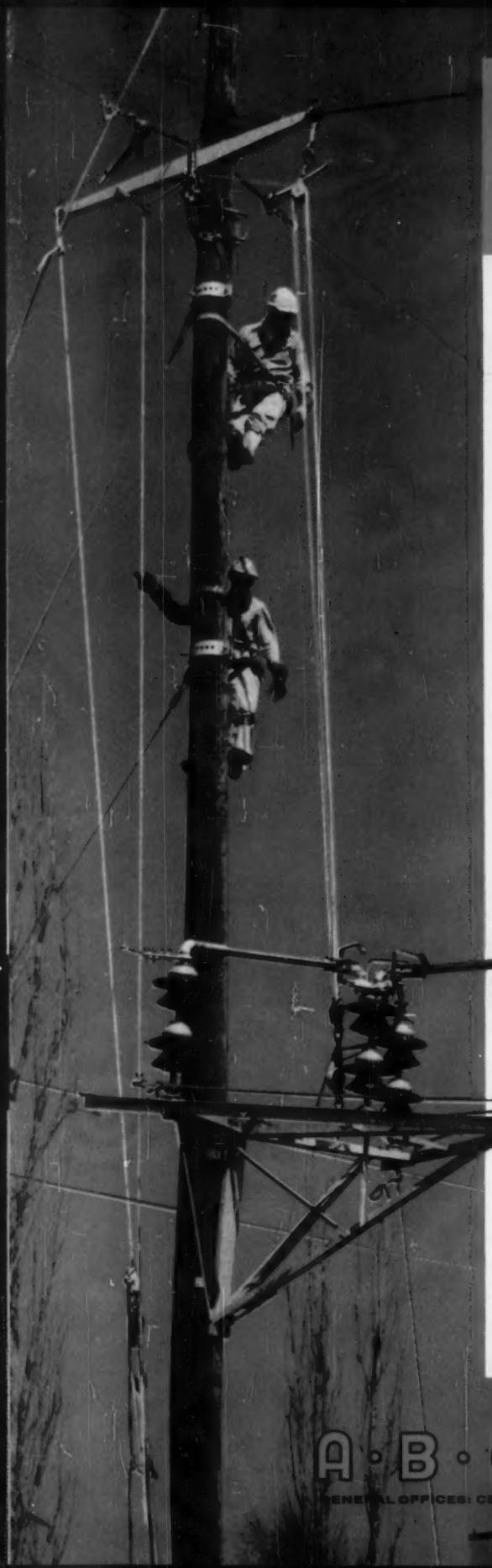
eatures a simple, straight-through cur-. The rigid square hollow blade and s bar copper construction provide the capacity and mechanical strength to rity against damage from heavy fault

BTH Switches have *high pressure* contacts—copper to silver buttons. Toggle action of jaw automatically applies high pressure with minimum operating effort. Double blade latch holds switch firmly in closed position, releases easily with a pull of the hook stick.

w switch is typical of the advanced switching equipment you get from the Chance line...



et the finest in engineering design wheather your requirements are Amp disconnects or complete substation switching arrangements.



Cut tap switching costs by installing

CHANCE Type "GS" GOABS

You're dollars ahead from the start when you put Chance Type "GS" GOABS on the pole. GOABS are Group Operated Air Break Switches designed for vertical phase-above-phase mounting.

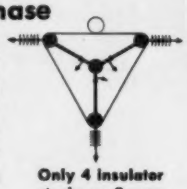
Only one pole for 1, 2 or 3 way switching

Single pole phase-above-phase mounting means lower initial costs, lower maintenance costs, and minimum right of way requirements.

Fewer Insulators per phase

Only 3 insulator stacks on 2-way

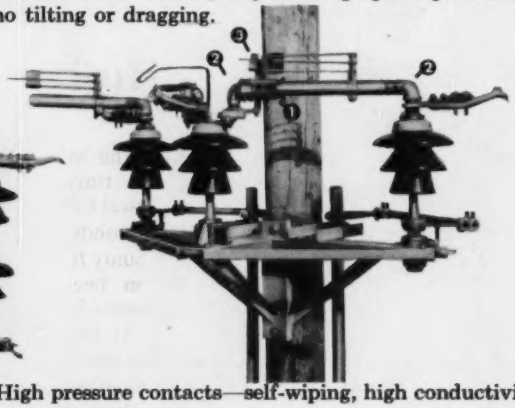
The "GS" design eliminates one insulator stack on each 2-way unit and two insulator stacks on each 3-way unit to provide up to 30% less weight.



Only 4 insulator stacks on 3-way

Speedy cost-cutting installation

GOABS are pre-assembled for maximum convenience in handling and installing. All-welded frames are completely assembled in all ratings. Assembling time is saved. Units are balanced for smooth, easy hoisting up the pole. There is no tilting or dragging.



1. High pressure contacts—self-wiping, high conductivity, silver to copper.

2. Braidless Construction—completely enclosed sealed silver-to-silver hinge contacts.

3. High-Speed Snap-Out Arcing Horns—to break magnetizing and charging currents.

Full NEMA *Rated*—7.5 to 69 KV, 400-600-1200 Amps, 1-Way, 2-Way and 3-Way.

CS58-14

A·B·CHANCE CO·

GENERAL OFFICES: CENTRALIA, MO. (A. B. Chance Co. of Canada, Ltd., Toronto)

ABC INDUSTRIES

'Bonuses for Brainwork' Pay Off for DP&L

Morale and money awards are on the rise at Dayton utility, where new suggestion plan wins high employee participation

"I submitted a suggestion yesterday. How large is my award?"

This question, eagerly asked by a Dayton Power & Light employee, may be a rather extreme example of employee reaction to the utility's recently revamped suggestion system. But it does reflect the enthusiasm which employees are showing.

In 1957, the revitalized suggestion program broke all kinds of records for the company. More employees participated, more suggestions were adopted, and the average award was higher than ever:

- Hard thinking employees sent in 772 ideas, compared with 334 in 1956 and a previous high of 387.
- Of the 772 suggestions, 692 were completely processed and 155, or about 20%, were adopted. Previous record for adopted ideas was 37 in 1947. In 1956 this fell to 23.
- Cash awards averaged $16.02 in 1957 (Compared with $8.84 in 1955 and $14.05 in 1956.)
- Large awards went to more employees: There was one for $200, at least three for $150, and many for $50 and $25.

Why this sudden surge of employee interest in sending in more and better suggestions? The impetus comes not only from the larger cash prizes, but also "the greater personal recognition given to suggestors", believes a DP&L spokesman.

The program, which sent suggestions soaring soon after its adoption in 1956, includes these features:

- Good suggestions are evaluated according to the amount the company would save by adopting them.
- All suggestions are handled anonymously to the last step.
- Winner receives a separate award check, instead of finding it included in his weekly pay check.
- Winner is presented the special check by his supervisor in ceremonies conducted in his department.

Before inauguration of the popular new system, employee reaction to the company's suggestions programs alternated between apathy and spurts of active participation. But until now, enthusiasm had been short-lived for various reasons: small awards, lack of recognition for winners, and failure of many adopted ideas to be put into effect.

In contrast, the present high level of employee interest and participation seems not only steady, but rising. Indications are, this will continue.

Although Dayton P&L's suggestion committee has made remarkable progress since inauguration of the new system, they're still aiming higher. At present rate, they may meet or surpass national figures.

The National Association of Suggestion Systems, whose members represent 1,300 of the 5,000 companies with suggestion systems, has supplied these 1956 national figures for all business and for the utility and transportation industry: Cash amount of average award, $30.73 and $24.39, respectively; cash amount of highest award, $10,300 and $1,884; and ratio of total suggestions adopted to total suggestions submitted, 26% and 25.3%.

The NASS points out, however, that its figures for utilities represent gas as well as electric utilities and often local transportation units.

CHARLES HARVEY'S IDEA won him $100, saves DP&L about $650 annually

Right to Condemn Upheld

The Maryland Court of Appeals has ruled that Potomac Electric Power Co has the "power and right" to condemn land in Montgomery County for construction of transmission lines. The ruling reverses a lower court's judgment.

At issue was the acquisition by the company of a 250-ft strip of land 40 miles long from Pepco's new Dickerson, Md., plant to Washington, D. C. Much of the right-of-way had been acquired through negotiation. The condemnation decision, however, of the county's circuit court on a section of the strip brought an appeal to the higher court.

Pepco, with corporate headquarters in the District of Columbia and Virginia, maintained that it inherited condemnation powers in Maryland as successor to Great Falls Power Co. Landowners' attorneys argued that condemnation of land 20 miles from Great Falls was beyond the privilege conferred on the predecessor company. Another contention was the Great Falls' condemnation privileges had expired by 1947 because of disuse.

Had the decision gone against Pepco, an effort for corrective legislation would have been necessitated at the next session of the Maryland legislature.

Many other states, by general law, permit "foreign" utilities to condemn, a company spokesman said. In addition, he added, any utility not granted condemnation powers by general law may find relief in special legislation—either granted years ago to a predecessor, as Pepco claimed, or specially tailored in the light of a particular situation.

Canaday Elected Vp of Arkansas P&L

Paul O. Canaday, 54 year old vice president of Middle South Utilities and veteran of 32 years experience in the utility industry, has been named executive vice president of Arkansas Power & Light Co. He will assume his position with AP&L, on September 1.

Graduating as an electrical engineer from University of Tennessee in 1926, he climbed the ladder to executive spots in many southern utilities. He is a former manager of eastern division, Tennessee Public Service Co; president, Holston Electric Co; assistant treasurer, and vice president of the former Electric Power & Light Corp; assistant treasurer and director, United Gas Corp; vice president and director, Mississippi Valley Generating Co; and vice president Middle South Utilities Inc. He joined Middle South—parent company of AP&L and three other Southern utilities—in 1949, and will retain his position there until September, when he assumes his new post with AP&L.

P. O. CANADAY

Davis Gets Executive Vp Post

The recent election of J. Luther Davis to the position of executive vice president has been announced by the Tucson Gas, Electric Light & Power Co.

The new post of executive vice president has been created to broaden the company's management base, a change necessitated by the rapid growth of the Arizona utility.

Davis moves into this new position after having served in several managerial capacities with the company, including the posts of vice president and assistant to Pres J. R. Snider.

A graduate of the University of Arizona, Davis served as the city manager of Tucson for two years before joining the utility in 1955.

J. L. DAVIS

Jones Fills MP&L Vp Slot

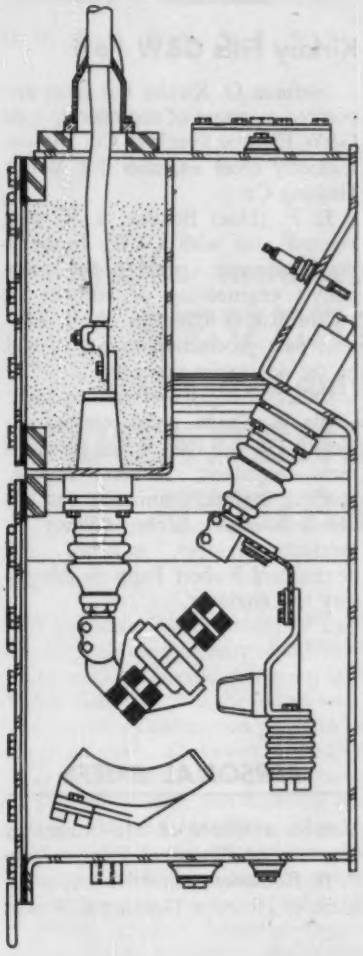
Recently elected vice president of Mississippi Power & Light Co is C. Edmunson Jones. Jones, in a newly created slot, becomes the utility's fifth vp. Responsibilities include union negotiations, employment standards, safety and training programs, wage policies, and employee benefit plans.

An employee with MP&L for 31 years, he joined the utility after graduating from the college of Engineering, University of Mississippi. Beginning as a student engineer, he has held posts as local manager, power sales manager, industrial sales manager, division sales manager, and his latest major appointment, in 1954, as director of personnel. He also fills in as chairman of personnel administrative section, Southeastern Electric Exchange.

C. E. JONES

THE G&W THINLINE SWITCH

reduces space requirements and costs on network transformers



Here's a switch that has everything to your advantage. On your next transformer, it will help to reduce space requirements and installation costs. The unit occupies little more than seventeen inches from front to back. In spite of these reductions no sacrifice has been made in the electrical characteristics or in the usual G&W high standards of construction.

The Thinline may be welded or bolted to the transformer. Ready access to the cable terminating compartment permits ease of installation for three single conductor (as shown) or a three conductor cable. Transformer connections are made through the sealed porcelain tubes in the angle pocket. One or two electrical interlocks are optional and grounding contacts permit connection of "A," "A-B" or "A-B-C" phases of the cable in sequence or in a simultaneous connection of the latter.

The dielectric medium may be either oil or askarel.
The switch illustrated is rated 15 kv, 400 amperes.
Contact a G&W representative for full details.

G&W ELECTRIC SPECIALTY COMPANY
3500 WEST 127TH STREET • BLUE ISLAND, ILLINOIS

CANADIAN MFR. • POWERLITE DEVICES, LTD. • TORONTO, MONTREAL & VANCOUVER

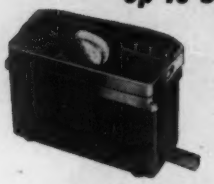
D580

PORTABLE TEST INSTRUMENTS by CURTISS-WRIGHT

made under licensing agreements with one of Germany's leading instrument manufacturers

INSULATION and Earth Resistance TESTERS

up to 5000 Volts in 5-lb. Package



The extremely compact and rugged insulation testers have a built-in, hand-cranked voltage generator. New design low-torque hand-crank. A patented mechanical rectifier permits generation of up to 5000V. ±1.5% accuracy. Length of scale 2¾". Available in eight models.

MODEL NO.	TEST VOLTAGES	MEASURING RANGES	
8001	500V	0-50 megohms	0-260V 0-520V
8002	100V 500V	0-10 megohms 0-50 megohms	Four low ranges:
8003	250V 500V	0-25 megohms 0-50 megohms	0-200 ohms 0-2,000 ohms
8004	500V 1000V	0-50 megohms 0-100 megohms	0-20,000 ohms 0-200,000 ohms
8005	625V 1250V 2500V	0-100 meg. and 6.5-500 meg. 0-200 meg. and 13-1000 meg. 0-400 meg. and 26-2000 meg.	
8006	2500V 5000V	0-500 meg. and 24-2000 meg. 0-1000 meg. and 48-4000 meg.	
8007	For earth resistance measurements	0-2 ohms 0-10 ohms 0-100 ohms	0-1,000 ohms 0-10,000 ohms
8008	For measuring earth resistivity (ohm-cm) and earth resistance	0-2 ohms 0-10 ohms 0-100 ohms	0-1,000 ohms 0-10,000 ohms

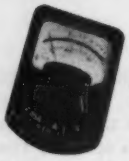
PORTABLE BRIDGES and MULTIMETERS

MODEL 7009 Wheatstone Bridge

Accuracy and portability combined with simple operation—one range switch, one large dial. Ideal for all electrical and electronic work.

Model 7009 Wheatstone Bridge has a total range of 0.05 to 50,000 ohms divided in five ranges. ±0.5% to ±2% accuracy depending on range used. Can also be used with external a-c test voltage and scope null detection for higher sensitivity of null.

Model 7010 Kelvin Bridge has four ranges covering total range of 0.0001 to 2 ohms. ±1% to ±2% accuracy depending on range used.



MODEL 7001 Multimeter

Model 7001 Multimeter is an extremely rugged, versatile, and accurate AC-DC current and voltmeter with 20 ranges (up to 6 A a-c!), including ohm scale for continuity testing and calibrated scale in foot-candles for light measurements. Uses selenium light cell for power. ±1% accuracy.

Model 7002 R-C Meter is a handy pocket R-C meter with ±1.5% accuracy for the resistance scale. Individually calibrated ranges (3) covering 5 to 1,000,000 ohms and 0.5 to 2,500 mfd. Uses 1.5V battery. Scale length 1¾".

For complete information, write Electronic Equipment Department.

ELECTRONICS DIVISION
CURTISS-WRIGHT
CORPORATION • CARLSTADT, N. J.

Kirkby Fills G&W Post

Norman O. Kirkby has been appointed manager of engineering with G&W Electric Specialty Co. He was formerly chief engineer for Vapor Heating Co.

E. F. (Doc) Bentley, a 35 year veteran also with G&W, formerly plant manager, goes to the company's engineering department as administrative engineer. A. J. Mowat, past production manager, will be the new plant manager.

Other changes at G&W include: Clyde W. Shade, chief product engineer; George Lusk, chief development engineer; Robert Rowan, product engineer, potheads and cable accessories; John Clancy as product engineer, switches and boxes; and Robert Papp as laboratory test engineer.

PERSONAL BRIEFS

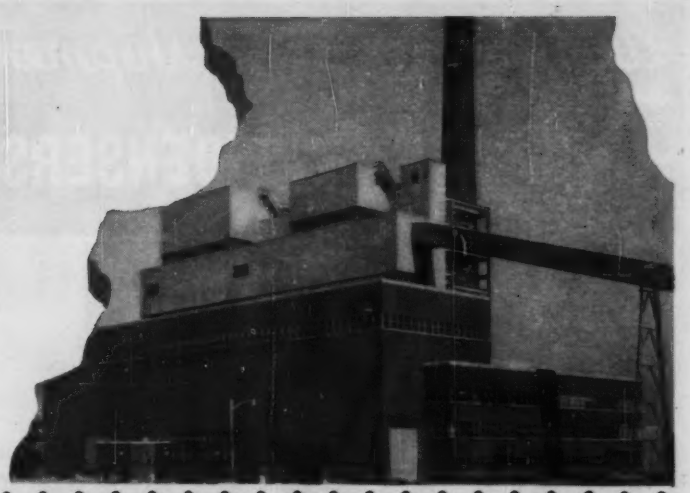
Named a fellow of the American Institute of Electrical Engineers is **P. H. Robinson,** executive vice president of Houston Lighting & Power Co.

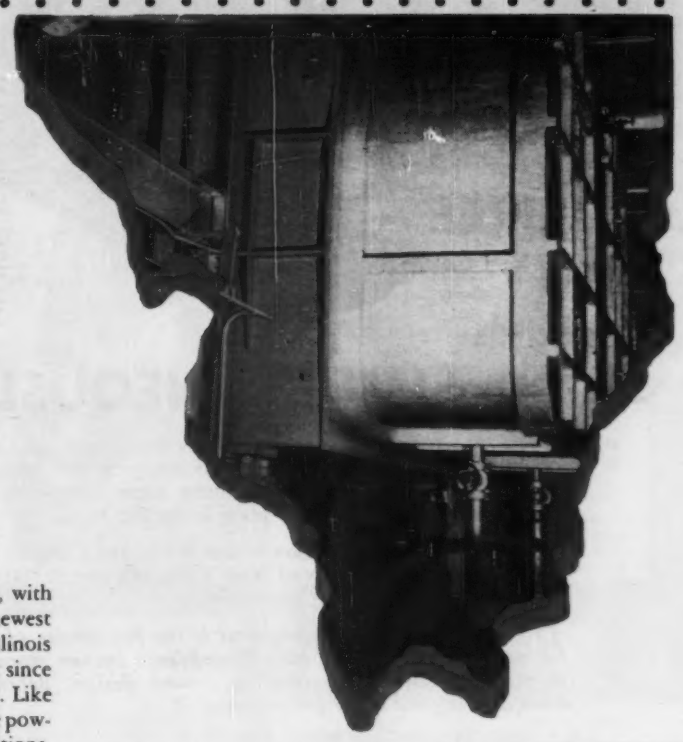
Pacific Power & Light Co has named **Vane R. Wilder** as assistant power superintendent for the three-dam Lewis River hydro development in Oregon.

At Toledo Edison Co, **Morrison L. Conner** will succeed **C. E. Vanell,** who will retire as TECO safety supervisor July 1.

Another addition for

ILLINOIS POWER COMPANY





Another installation of

REVERE

Arsenical Admiralty

CONDENSER TUBES

The Vermilion Power Plant, near Danville, Illinois, with a total generating capacity of 183,000 KW, is the newest addition to the electric generating facilities of the Illinois Power Company. It is the fourth such station built since the start of a construction program begun in 1944. Like its predecessors, it has every modern device to assure power at the flick of a switch at all times under all conditions.

Helping to make this unfailing performance possible are 162,288 pounds of Revere Arsenical Admiralty condenser tubes in the #2 condenser. Water, which passes through the tubes, is pumped from a 120-acre lake created by damming up a ravine formed by the Vermilion River.

Revere Arsenical Admiralty metal was selected to fit the operating conditions encountered in this specific operation. Other conditions require other alloys. It is this careful selection of the "tube to fit the job" that has built, for Revere, a reputation for dependable condenser tube performance under all kinds of operating conditions.

Over the years Revere's Research Department has compiled extensive data regarding the relative corrosion resistance of the different alloys under a wide variety of operating conditions. Why not take advantage of this storehouse of facts and consult with Revere's Technical Advisory Service before selecting the tubes for your equipment?

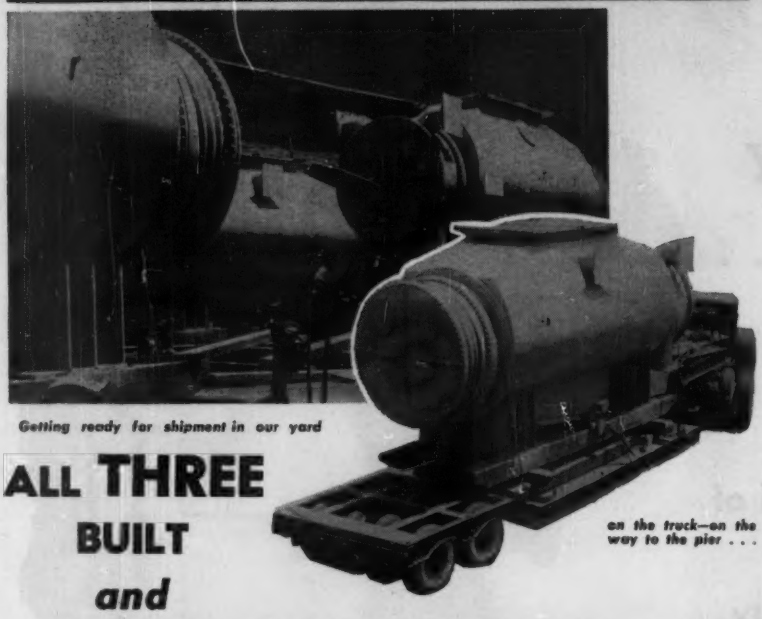
REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

Mills: Rome, N. Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities, Distributors Everywhere.

Another overseas shipment of CONSECO CONDENSERS



Getting ready for shipment in our yard

on the truck—on the way to the pier . . .

ALL THREE BUILT and SHIPPED SIMULTANEOUSLY

The production facilities of CONSECO are once again illustrated by the simultaneous building in our own plant in Hoboken and shipping from there three Condensers destined for use in a steam power plant in the Far East.

Presently under construction in our Shops are a 45,000 sq. ft. Condenser for the City of New York, and one 50,000 sq. ft. unit for Dairyland Power Cooperative.

Big or small, Conseco Equipment is the first choice of Engineers who have well-placed confidence in our more than 30 years experienced engineering, sound design, dependable manufacturing and better performance.

CONDENSER SERVICE & ENGINEERING CO., INC. CONSECO

Designers and Builders of Equipment for Power, Refining, Chemical and Marine Industries

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◀ Send for this CONSECO Steam Condenser Bulletin

For more data consult Chemical Engineering Catalog pages 559-562

Conseco Designs, Builds, Engineers

All Evaporating, Feedwater Heating, Condensing, Air Removal and Condensate Cooling Equipment required in any Thermal Power Generating Plant.

Condensers • Evaporators • Deaerators • Converters
Feedwater Heaters • Steam Jet Air Ejectors

Succeeding the late **Lee W. Long** as Youngstown division superintendent of substations, Ohio Edison Co, is **L. A. Carlson.**

Monongahela Power Co has appointed **J. Duane Gorman** to handle special assignments with the executive department. **Harold L. McMillen** will be the company's new Elkins Division manager.

New Portsmouth manager for Virginia Electric & Power Co, is **Allan S. Radfield,** replacing **P. W. Smith,** new manager of Vepco's Alleghany district.

Named general superintendent of the overhead lines department of Detroit Edison Co is **Donald G. Emerson,** succeeding the late **John A. McCowan.**

T. Hunt Vaden, vice president of Southern Co, has transferred from the company's Atlanta branch to its Birmingham office.

Recently named manager of the Pennsylvania New Jersey Maryland Interconnection is **Wilmer S. Kleinbach.**

Philadelpia Electric Co has named **John J. Allen** as engineer in charge of mechanical research section of the research and development department.

The election of **Nelson J. Ambrose** as treasurer of Stone & Webster Service Corp has been announced. He has replaced **Kenneth R. Teele,** resigned.

Stepping into two newly-created top management slots at Westinghouse International are **A. B. McCloskey,** vice president, marketing; and **R. L. Jeans,** vice president, products. **R. D. McManigal** was elected vice president and asisstant to the president.

William G. Spiegelhalter, engineering manager, Product Design—Room Air Conditioning, General Electric Co, has been named chairman of the newly-formed Room Air Conditioning Section of the National Electrical Manufacturers Association. **Robert H. Meyerhans,** director of engineering, Fedders-Quigan Co, is vice chairman.

J. P. Hamblen, president, Southern Electric Supply Co, has been elected president of the National Association of Electrical Distributors. He succeeds **George Albiez,** President, Englewood Electrical Supply Co.

DuRay E. Stromback, formerly manager of engineering of Plymouth Manufacturing and Engineering, Burroughs Corp, has been named Plymouth's new general manager. He succeeds **Robert A. Niemi,** who is resigning to accept a position outside the corporation.

Olin Mathieson Chemical Corp announces the creation of four new divisions and the following appointments as vice president: **Jess E. Williams,** metals . . . **Carroll Copps,** energy . . . **Robert H. Evans,** packaging . . . and **Edward Block,** metals. Other appointments include **Walter F. O'Connell,** corporate vice president for finance, and **Russell Hopkinson,** corporate vice president for commercial development.

Hal A. Skutley has been named North Central regional engineer of Kellogg Switchboard and Supply Co.

Promotion of **J. R. Cutinella** to head the Boston branch of the Hoover Co and **E. J. Hilscher** to become branch manager at Buffalo, have been announced.

Two new branch managers for the air conditioning department of General Electric Co are **A. S. Garven,** New Jersey area, and **I. W. Pittleman,** Cleveland, Ohio area.

Pinckney B. Reed has been named to the newly-created post of vice president, educational electronics, by the Radio Corporation of America. Before his appointment he was vice president, RCA International, in charge of sales.

The Elliott Company announces the following promotions to district office manager: **E. F. Downey,** Charlotte, **A. P. Grimm,** Milwaukee; and **W. J. Lyons,** Newark.

R. W. Cook, deputy general manager of the Atomic Energy Commission, has submitted his resignation effective not later than the adjournment of this session of Congress.

SCHENECTADY UTILIZES OLD CONCRETE POLES BY ADDING NEW P & K ALUMINUM CONVERSION UNIT

Problem: how to relight at a minimum of cost, both in units and erection. Solved by P & K engineers! For Schenectady, New York, the local utility utilized the old standing concrete poles by fastening tapered aluminum shafts with graceful six-foot arms and incandescent luminaires. Thus, in one easy-to-install unit they provided the lighting intensity they wanted at a minimum cost. As for maintenance problems, there are none. P & K all-aluminum standards never need painting or other costly maintenance. They maintain their good looks and offer unsurpassed resistance to weather. For your next lighting installation, consult P & K first. For more help, send for Catalogs ALS and L-2 describing standards and lighting units for all applications.

SCHENECTADY PREFERRED P & K BRIDGE CONVERSION UNITS

Of course, since P & K offers a wide range of styles in standards, both davit and the conventional type, they, in effect, customized the installation with modified standard parts. It's easy to modernize existing obsolete lighting installations the P & K way.

P&K

PFAFF & KENDALL

84 FOUNDRY ST., NEWARK 5, NEW JERSEY

What a line...

CF&I GALVANIZED STEEL STRAND

Where overhead distribution lines must cover long spans, or in areas where high velocity winds and adverse weather impose a severe strain on power poles, dependable guying is a must.

To provide safe installation and long, trouble-free service life, ground crews prefer CF&I Galvanized Steel Strand. It is made of steel with exactly the right chemical and physical properties to assure high strength and easy workability. The wire is carefully drawn, stranded, cleaned and galvanized with a tightly-bonded coat of pure zinc to produce a corrosion-resistant finish that won't flake, even when severely bent.

CF&I Galvanized Steel Strand meets or exceeds ASTM Specification A-122 or A-363, and is made in a seven- or three-wire construction to meet your specifications. Your nearby CF&I representative or local electrical distributor can give you complete details. Call him today.

CF&I GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo Billings • Boise • Butte • Denver El Paso • Ft. Worth • Houston • Kansas City • Lincoln • Oklahoma City • Phoenix • Pueblo • Salt Lake City • Wichita
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • San Leandro • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • NewYork • Philadelphia
CF&I OFFICES IN CANADA: Montreal • Toronto • CANADIAN REPRESENTATIVES AT: Calgary • Edmonton Vancouver • Winnipeg
5904-A

General Electric Co personnel changes: **Richard H. Gorman** takes over as manager of product planning of the company's distribution assemblies department. Newly elected manager of appliance control department at Morrison, Ill., is **Gordon K. Stebbins. Grant A. Morrison** has been named manager of product design and application engineering at metal products department, Detroit. Retiring as engineering manager of the GE meter department after 34 years of service is **G. Rodger Sturtevant;** filling his vacated slot is **William B. Lynn,** formerly manager of design engineering.

Responsibility for developing new markets for current products and new product lines for Sylvania-Corning has been assumed by **Dr. Bernard Kopelman,** with title of director of market development. SYLCOR specializes in the development and fabrication of fuels for atomic reactors, reactor components and materials, and in the development of nuclear fuel recovery processes.

Harold J. Bentson is new chief mechanical engineer for the power and industrial division of Bechtel Corp of San Francisco.

Sylvania Resarch Laboratories announced the promotion and reassignment of **Donato J. Bracco** as manager of planning; **Daniel Lazare** as divisional manager of project administration, and **Benjamin W. Leavitt** as technical coordinator of the division's research program.

Reorganization within the Consumers Products Division, Philco Corp, has placed **Harold W. Schaefer,** former vice president and general manager, appliances, as vice president, product development and planning for appliances. **Armin E. Allen,** former product manager for TV, has become vice president, product development and planning for electronics. New vice president, marketing is **Henry E. Bowes.** Other appointments include: **John A. Rishel, Jr.** manager of marketing; **Gibson B. Kennedy,** general sales manager of all consumer products, and **James J. Shallow,** general manager, merchandising for the marketing department.

American Institute of Electrical Engineers has elevated these seven members to the grade of fellow for oustanding contributions to the profession:

William B. Loper, chief engineer, California Electric Power Co, "for contributions to the development of a rapidly expanding electric power system." . . . **Edward R. Moore,** manager of engineering, Detroit Edison Co, "for his contributions in the planning and development of a large electric power system." . . . **Richard F. Stevens,** chief of design, Bonneville Power Administration, "for contributions to the development of major high voltage power systems in the Pacific Northwest." . . . **Frederick T. Bear,** vice president in charge of engineering, Delaware Power & Light Co, "for contributions to increased capability of electric power systems." . . . **Milton Eaton,** consulting electrical engineer, Shawinigan Falls, Quebec, Canada, "for contributions to the design and automatic control of electric steam generators." . . . **Robert O. Loomis,** chief planning engineer, Georgia Power Co, "for contributions to the planning and development of a large electric power system." . . . **Francis X. Lamb,** vice president, engineering, Weston Instruments, Division of Daystrom, Inc, "for contributions to electrical measurements by invention and design, especially for exacting and rugged military service."

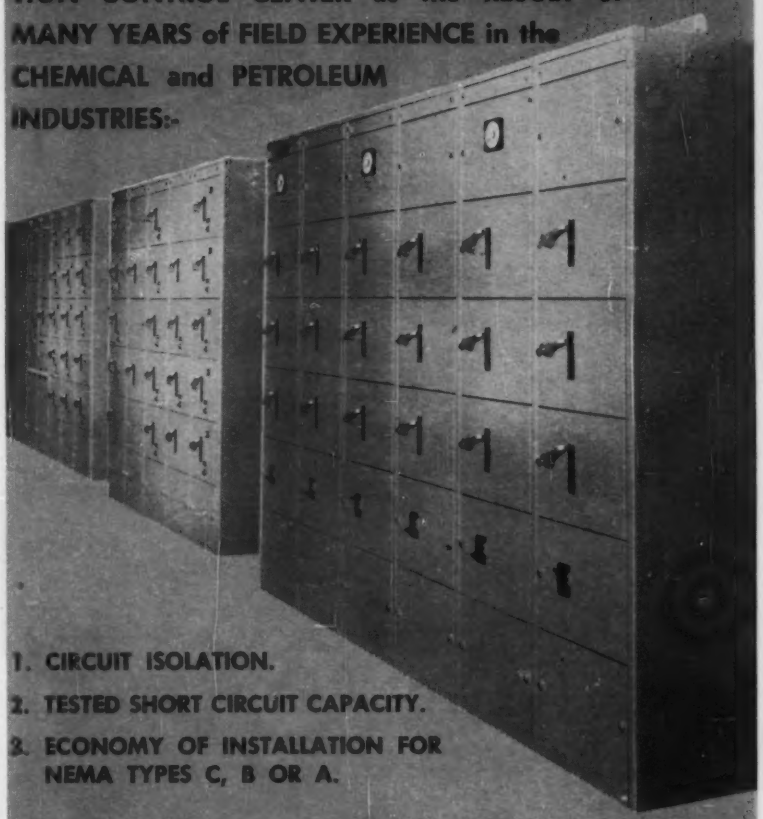
Recently appointed chief engineer of Knopp Inc is **Wilson A. Pritchett. Dr Harold S. Black,** research engineer with Bell Telephone Laboratories, has been selected by the American Institute of Electric Engineers to receive the 1957 Lamme Gold Medal. Presentation will be made on June 23, during the summer general meeting of AIEE in Buffalo.

OBITUARY

Daniel Webster Cole, 95, formerly on the engineering staff of Ebasco Services Inc, died June 2 at his home in Marietta, Ga.

HERE *is the* ENGINEER'S CONTROL CENTER

WITH POSITIVE FEATURES THAT WERE DEVELOPED and DESIGNED INTO THIS ALL-NEW MAXIMUM PROTECTION CONTROL CENTER as the RESULT of MANY YEARS of FIELD EXPERIENCE in the CHEMICAL and PETROLEUM INDUSTRIES:-



1. CIRCUIT ISOLATION.
2. TESTED SHORT CIRCUIT CAPACITY.
3. ECONOMY OF INSTALLATION FOR NEMA TYPES C, B OR A.

MAXIMUM PROTECTION CAN ONLY BE ACHIEVED BY COMPLETE CIRCUIT ISOLATION PLUS TESTED SHORT CIRCUIT CAPACITY.

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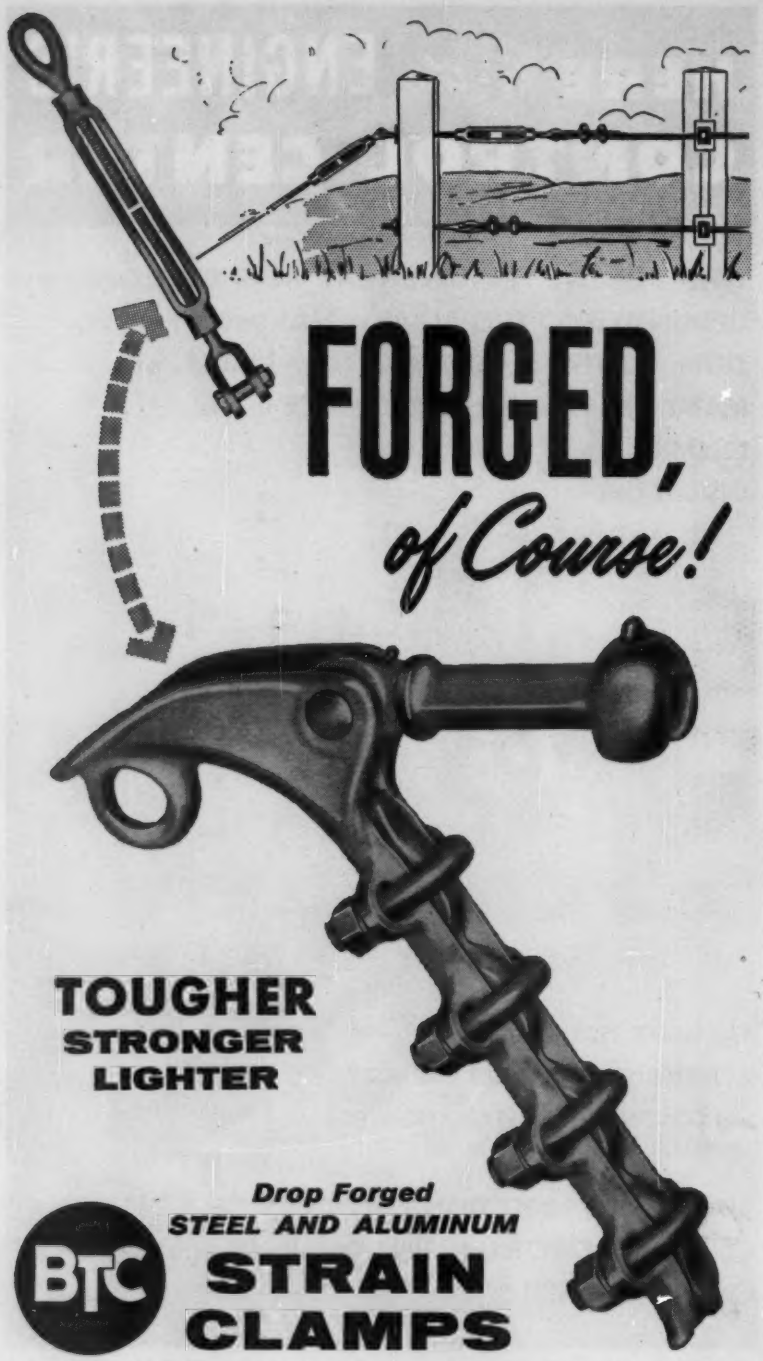

SALES ASSIGNMENTS

COMPANY STAFFS

General Electric Co, in an expansion of its microwave marketing organization, has appointed three new district sales managers. They are Samuel R. McConoughey, who'll manage the new microwave office in Dallas, Tex.; Ralph W. May, for the Redwood City, Calif., office; and A. E. Sinclair, at Atlanta, Ga.

Sprague Electric Co has appointed Andrew S. Kariotis manager of the new Dallas office. It will be located at 3603 Lemmon Ave, Dallas, and will serve Texas, Louisiana, and Oklahoma.

Westinghouse Electric Corp has made these appointments: Arthur G. Kane, Jr, is manager, of the new apparatus sales office serving northwest Los Angeles County and all of Ventura, Santa Barbara, and Kern counties. The office is located at 15217 Burbank Blvd, Van Nuys, Calif. . . . William B. Cott has been appointed Northeastern regional manager for Westinghouse's Air Conditioning Division with headquarters in New York City. Walter L. Hunken has become Middle Atlantic regional manager with headquarters in Staunton, Va.

REPRESENTATIVES

R T & E Corp has appointed H. J. Clark, 1803 First National Bank Building, Birmingham, Ala., to be manufacturers' representative of distribution transformers and protective equipment in the state of Alabama.

Allis-Chalmers Manufacturing Co has appointed Wholesale Electric Supply Co of Houston, Tex., as agency for feed voltage regulators, power transformers, unit substations, switchgear, and circuit breakers. The agency will serve the counties of Jackson, Lavaca, Fayette, Washington, Burleson, Brazos, Grimes, Walker, San Jacinto, Liberty, Jefferson, and Angelina. Also included is Calcasieu parish in Louisiana . . . Allis has also appointed Kurz Electric Service of Appleton, Wis., as its distributor for motors, controls, and transformers.

(*Continued from page* 84)

anti-friction bearings has not been equally favorable. Moore cited the case of pulverizer exhauster fan motor bearings. During ten years, anti-friction bearing failures on eight fans caused forced outages, with many other bearing replacements made during 12-14 month overhauls. The last pulverizer installed at the power plant, equipped with split sleeve bearings and oil pumps, operated for about 2½ years satisfactorily.

Moore said that anti-friction bearing on main-unit turning-gear motors failed because of vibration during normal unit operation, while motors with sleeve bearings have given no trouble. In the case of transformer-oil circulating pumps, comparative tests lasting about three years on two 100-Mva units showed that anti-friction bearings performed satisfactorily on pumps only during continuous operation, while bearings in pumps undergoing a normal cycling operation failed in 3-5 months. An experimental pump with sleeve bearings, replacing one of the pumps that failed, has not failed to date.

Likes Sleeve Bearings

Where anti-friction bearings must be used, said Moore, they should be of adequate design and should be equipped with relief-type grease fittings and drains. For vertically mounted equipment, oil lubricated anti-friction bearings provide better service than grease-lubricated units. Nevertheless, he concluded, although sleeve bearings have considerably higher starting friction and somewhat higher running friction and require more complex lubricating systems, they contribute significantly to equipment availability and maintenance, and operation.

Overvoltage switching hazards may be eliminated through use of properly designed contact-shunting resistors in high-voltage oil circuit breakers, stated A. E. Kilgour, Allis-Chalmers Mfg. Co. Shunt resistors offer a positive means of controlling overvoltages to harmless values through absorption of line energy, eliminate the need to specify the number of restrikes as a criterion of performance, and divide the

(*Continued on page* 206)

GAI-TRONICS
COMMUNICATIONS
WERE SELECTED FOR...
Shippingport
At the first full-scale, atomic-electric power plant devoted exclusively to serve civilian needs, Duquesne Light Company, builders of the electric generating portion and operators of the entire facility have installed — GAI-TRONICS communication equipment.
Throughout the world, wherever a highly dependable, voice communication system for use in high noise level areas is needed — you'll find GAI-TRONICS specified by name.
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Complete information on our new, GTC (GAI-TRONICS Transistorized Communications) is now available. Write today for a copy of our completely illustrated descriptive booklet.
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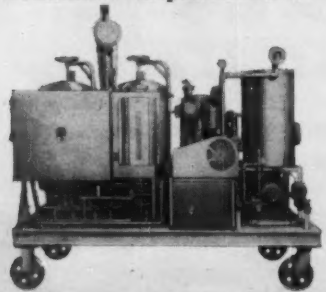
CFC PURIVAC means SAFETY in Oil Reconditioning

The CFC Purivac filters, dehydrates and degasifies insulating oil in one *safe* operation. Purivac is safe for the operator — the apparatus — and the oil. No other reconditioning system offers all these safety features:

- centralized control panel
- automatic temperature control
- automatic liquid level controls
- automatic vacuum controls
- relief valves on all pumps
- all pump drives guarded
- drip-proof switches
- oil-proof wiring
- low-watt density heaters
- insulated hot oil vessels
- sampling cocks to check oil
- low oil temperature requirements

Installations in leading utilities throughout the country have proved that CFC Purivac is safe—economical—effective in restoring oil to "like-new" condition. Write for technical literature to Department EW.



COMMERCIAL FILTERS CORPORATION
Melrose 76, Massachusetts
Plants in Melrose, Mass. and Lebanon, Ind.

voltage equally among interrupters of any one phase. In addition, said Kilgour, they reduce the rate of rise of recovery voltage during inductive switching and limit inrush current upon energization of the circuit.

Use of sulfur-hexafluoride (SF_6) gas in high-voltage interrupters was discussed by R. C. Boyd, Westinghouse Electric Corp. A variation of 25% of normal gas pressure (three to four atmospheres) can be tolerated without appreciable effect on breaker performance, he said.

Gives Ways to Cut Noise

Practical ways to reduce noise in large induction motors were presented by Russell T. Rosenquist, Elliot Co. The most difficult type of noise-aerodynamic sound to contend with can be reduced by special design of fans on larger machines and two-pole motors, by designing the shape and spacings of rotor and stator slots on slower-speed machines so that an inefficient siren is produced, and by building sound-absorbing materials into larger, higher-speed machines. Along with this latter approach, baffles in the air intake and/or discharge chambers will reduce aerodynamic noise.

Measures to reduce noise in medium transformers were discussed by T. J. Twomey, General Electric Co. An external sound enclosure which houses the transformer, but not the fans, cooling tubes, or bushings, is proving effective. Resiliant tank mounts may be designed to reduce the transmission of sound to nearby objects which re-radiate it, said Twomey. In rare cases, he said, generator tooth ripple may be a harmonic of some fundamental which resonates some member of the transformer. Removal of shipping wedges usually does not reduce the generation of sound appreciably.

Radio Users Meet

Effect of proposed changes in FCC rules governing use of narrow-band mobile radio was outlined by S. C. Bartlett, American Electric Power Service Corp, before Pennsylvania Electric Association's Communications Committee, May 5-6, at Greensburg, Pa. Assuming that FCC docket 12295 becomes effective, said Bartlett, the industry will be at least twice as well off as at present, as far as the number of channels are concerned. Use of split channels would be facilitated materially if FCC would require limiting to 5 kc the modulation deviation of all wide-band base and mobile transmitters within six months. While this requirement would not produce operation in conformance with narrow-band standards, it would make openings in the spectrum for the use of new stations.

Both old and new licensees, said Bartlett, can operate satisfactorily even though there may be some mutual interference until the older wide-band equipment is retired. FCC docket 11997 calls for estimates of channel requirements of all users within the next decade. Best estimates indicate that existing users will need 79% more channel assignments and that 1,500 new users will appear. This adds up to 6,000 channel assignments in 25-890-Mc spectrums for public use.

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vice users are given a reasonable share of the new channel assignments, the electric industry must submit data and generally try to assist FCC in reaching an orderly and logical conclusion. Therefore, Bartlett urged users to express their opinions on these matters to National Committee for Utilities Radio.

Suggestions regarding utility use of telephone facilities for tone signaling and control services were offered by L. R. Huggler, Bell Telephone Co of Pennsylvania. Although the telephone company has circuits and methods available to make special services available, he asked that utility engineers investigate whether the requirements they establish are necessary and necessarily desirable. Because each use of leased wires must be studied on its individual merits, with cooperation among the telephone and utility companies and the maker of terminal equipment, Huggler recommended that the user of a leased channel make known potential future uses when applying.

Urge 5 Ways Safety Pays

Five ways in which an effective safety program pays off were developed in round-table discussions during the 65th annual meeting of the Edison Electric Institute Accident Prevention Committee recently at Toledo, Ohio.

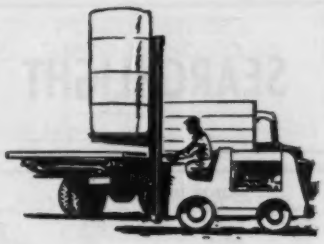
Active participation by top management is of major importance to safety programs. Ten ideas of the kinds of active participation grew out of the discussion. These, the committee decided, need further study before formal recommendation will be made to companies or the industry. Nevertheless, they suggest areas of improvement in safety programs where management could help by:

1. Attending or participating in employee safety meetings, inspections, presentations of safety awards, and accident investigations.

2. Establish and maintain an active safety policy.

3. Include safety in evaluating the

(*Continued on page* 208)



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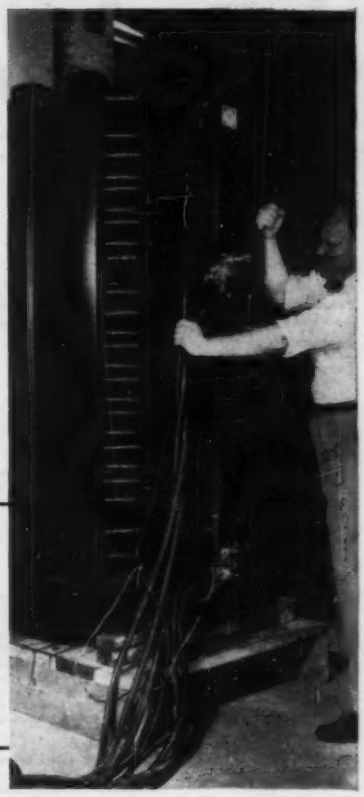

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Urges Ways Safety Pays (*Continued from page* 207)

performance of an individual employee.

4. Support reasonable disciplinary actions in cases of failure to follow safe practices.

5. Hold every level of supervision accountable for safety.

6. Provide for effective training and an adequate, competent, safety staff.

7. Place the same emphasis on accident prevention as on efficient production.

8. Demonstrate that safety is integral to all operations.

9. Direct engineering and operating personnel to consult with the safety representative on designs.

10. Appoint a joint safety-operating committee to work toward uniform accident prevention rules among companies.

Electric Shock and Burn Subcommittee reported that although injuries were almost 100 fewer in 1957 than in 1956, fatality and lost-time figures remained almost constant and the severity rate (days lost per million man-hours) was 2.6 times greater. This higher severity rate grew out of an average of 747 man-days per lost-time contact injury, which includes four total permanent disabilities and 22 partial ones. Total of 53,000 man-days chargeable to lost-time contacts represents an average of $45,000 per reporting company.

Examination of the principal contacts reported prompted the subcommittee to ask:

1. Are employees properly educated to low-voltage hazards?

2. Is suitable head protection provided? Is management aware that one head contact can cost more than furnishing all employees with proper head gear?

3. Is "rubbering-up" equipment adequate and rules enforced?

4. Are employees permitted to work on "dead" lines without using grounds, rubber goods, and gloves?

5. Can supervisors be better trained to protect personnel from contact injuries?

6. Are tailboard conferences held?

7. Are engineering and operating departments educated to the fact that accident prevention represents definite savings?

Interest was expressed after a showing of "Electric Power and Common Sense," a 35-mm, 28-min color movie presented by E. H. Wessells Jr, Western Massachusetts Electric Co. Produced by Bay State Films, Agawam, Mass., for Western Mass. Electric and other New England utilities, the film depicts the hazards of contact with overhead lines and equipment.

HAND BELLOWS for artificial resuscitation is shown to EEI Committeemen

A drop in disabling injuries in the power production division to an average of 1.5 to 2 per 1 million man-hours for the last eight years has followed use of an employee safety suggestion plan, said A. J. Naquin, New Orleans Public Service Co. Of about 5,000 suggestions offered in 14 years, only one was not applicable. About 99% of the suggestions covered physical hazards in steam plants.

The Atomic Plant Safety Subcommittee called attention to increasing use of radio isotopes, X-ray weld testers, and other radiation-emitting devices by electric utilities. Precautions should be taken so that these devices are not hazards.

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The Meetings Calendar

JULY

National Housewares and Home Appliance Manufacturers Exhibits—Auditorium, Atlantic City, N. J., July 7-11.

Colorado Farm Power Council—Electric House Heating School, co-sponsored by Colorado State University Agricultural Engineering Department, Colorado State University, Fort Collins, Colo., July 10-11.

Oklahoma Utilities Association—Accounting Section Conference, Ardmore Hotel, Ardmore, Okla., July 18.

Western Summer Radio-Television & Appliance Market—Western Merchandise Mart, San Francisco, Calif., July 21-25.

AUGUST

Southeastern Electric Exchange Public Utility Executive Course—Georgia Institute of Technology, Atlanta, Ga., Aug. 4-29.

American Institute of Electrical Engineers—Special Technical Conference on Non-Linear Magnetics and Magnetic Amplifiers, Hotel Statler, Los Angeles, Aug. 6-8; Pacific General Meeting, Sacramento, Calif., Aug. 19-22.

The Institute of Radio Engineers—Conference on Electronic Standards and Measurements, NBS Boulder Laboratories, Boulder, Colo., Aug. 13-15.

Illuminating Engineering Society—National Technical Conference, Royal York Hotel, Toronto, Canada, Aug. 17-22.

SEPTEMBER

Edison Electric Institute—Accounting Division and Section Organization Meeting, sponsored jointly with AGA, Netherland Hilton Hotel, Cincinnati, Ohio, Sept. 8-9; Meter and Service Committee, Driscoll Hotel, Corpus Christi, Texas, Sept. 22-24.

Maryland Utilities Association—34th Fall Conference, The Cavalier-Sir Walter Raleigh Hotels, Virginia Beach, Va., Sept. 12-13.

Rocky Mountain Electrical League—Annual Fall Convention, Jackson Lake Lodge, Moran, Wyo., Sept. 14-17.

American Institute of Electrical Engineers—Power Industry Computer Application Conference, King Edward Hotel, Toronto, Canada, Sept. 15-17.

MORE BIG DATES FOR '58

Edison Electric Institute — Industrial Relations Committee Round Table Conference, Hotel Drake, Chicago, Ill., Sept. 29-Oct. 1.

National Electrical Manufacturers Association—Annual Meeting, Atlantic City, Nov. 10-14.

National Association of Railroad and Utilities Commissioners—Annual Convention, Westward Ho Hotel, Phoenix, Ariz., Nov. 17-20.

Advertising Index

Allis Chalmers Mfg. Co. ..6, 7, 55, 171, 172
Aluminum Co. of America 110, 111, 182, 183
Aluminum Safety Products, Inc. 114
American Crossarm & Conduit Co. 112
American Mfg. Co., Inc. 118
American Metal Hose Div., American Brass Co. 115
Anaconda Wire & Cable Co. 113
Anderson Electric Corp. 51

Bell Lumber & Pole Co. 177
Bell Telephone Laboratories 47
Blackburn Corp., Jasper 28
Blaw-Knox Co. 53, 64
Brewer-Tichener Corp. 204
Bristol Co., The 70
Brown Company 170
Brown Boveri Corp. 44
Buffalo Forge Co. 16, 17
Burndy Corp. 105
Bussmann Mfg. Division McGraw-Edison Co. 116, 117

C&D Batteries, Inc. 166
Cable Spinning Equipment Co. 162
Central Transformer Corp. 52
Chance Co., A. B. ..119, 191, 192 193, 194
Chase-Shawmut Co. 164
Colorado Fuel & Iron Corp., Wickwire Spencer Steel Div. 202
Combustion Engineering, Inc. 10, 11
Commercial Filters Corp. 206
Condenser Service & Engineering Co., Inc. 200
Copperweld Steel Co. 43
Cornell-Dubilier Electric Corp. 156, 157
Crescent Tool Co. 54
Curtiss-Wright Corp. 198

Day-Brite Lighting Inc. 120
Diamond Expansion Bolt Co., Inc. 121
Directory of Engineers 209
Dossert Mfg. Corp. 63
Duff-Norton Co. 122

Ebasco Services Inc. 74
Electrical Engineers Equipment Co. 123
Engineers, Directory of 209
Everstick Anchor Co. 124
Exide Industrial Div., The Electric Storage Battery Co. ..... 3rd Cover

Fanner Mfg. Co. 159
Federal Pacific Electric Co. 18
Ferranti Ltd. 9

G&W Electric Specialty Co. 197
Gai-Tronics Corp. 205
General Cable Corp. 125
General Electric Co.
Apparatus Dept. 101, 162
Large Lamp Dept. 50
Globe Company 128
Goodrich Chemical Co., B. F. 29
Graybar Electric Co., Inc. 109, 126, 152, 154

Highway Trailer Co. 8
Holan Corp., J. H. 61
Holophane Co., Inc. 165
Hotpoint Co. 40
Hubbard & Company 127
Hubbell Inc., Harvey 129
Hughey & Phillips 162
Husky Products, Inc. 168

I-T-E Circuit Breaker Co., Switchgear Div. 41
Ilg Electric Ventilating Co. 130
Indiana Steel & Wire Co., Inc. 131
Ingersoll-Rand 69
International Creosoting & Construction Co. 132

Jenkins Bros. 46

KPF Electric Co. 14, 15
Kaiser Aluminum & Chemical Sales, Inc. 133
Kaiser Engineers Div., Henry J. Kaiser Co. 56
Kerite Co. 76
Klein & Sons, Mathias 135
Kuhlman Electric Co. ..... 4th Cover

Leach Company 137
Leeds & Northrup Co. 60
Line Material Industries 31, 32, 33, 34, 35, 36, 37, 38
Lotran Incorporated 169

McCabe-Powers Body Co. 71
Mercoid Corporation 134
Minneapolis-Honeywell 178, 179
Morrison-Pelsue Company 206
Murray Mfg. Co. 207

Natvar Corp. 167
Northeastern Engineering, Inc. 203

O. Z. Electrical Mfg. Co. 136
Ohio Brass Co. 23, 24, 138
Okonite Co. 4
Orangeburg Mfg. Co., Inc. 139

Pennsylvania Transformer Div., McGraw-Edison Co. 161
Permutit Company 58
Petersen Engineering Co., Inc. 39
Pfaff & Kendall 201
Philco Government & Industrial Div. .. 30
Pioneer Service & Engineering Co. ... 173
Pittsburgh Reflector Co. 140
Preformed Line Products Co. 106, 107
Pyle-National Co. 141

RT&E Corp. 59
Ray-O-Vac Co. 142
Reliable Electric Co. 143
Remington Rand Div. Sperry Rand Corp. 73
Republic Steel Corp., Steel & Tubes Div. 145
Revere Copper & Brass, Inc. 199
Riley Stoker Corp. 48, 49
Rockbestos Products Corp. 163
Rome Cable Corp. 174, 175

S&C Electric Co. 57
Sangamo Electric Co. 103
Sargent & Lundy Engineers 67
Searchlight Section 208
Sierra Electronic Corp. 176
Simplex Wire & Cable Co. 146
Southern States Equipment Corp. ... 181
Southwire Company 25
Square D Company 144
Subox Inc. 158
Sylvania Electric Products Inc., Lighting Div. 65

Templeton, Kenly & Co. 147
Texas Company ..... 2nd Cover
Thomas & Betts Co. 148, 149
Thor Power Tool Co. 150
Triangle Conduit & Cable Co., Inc. ... 151

United States Rubber Co. 66
Uptegraff Mfg. Co., R. E. 12, 13

Wagner Electric Corp. 68
Weaver Co., J. A. 72
Westinghouse Electric Corp. 26, 27, 185, 186
Wheeler Mfg. Co., C. H. 62
Wheeler Reflector Co. 42, 153
Worthington Corporation 75
York-Hoover Corp. 45

PROFESSIONAL SERVICES 209

CLASSIFIED ADVERTISING
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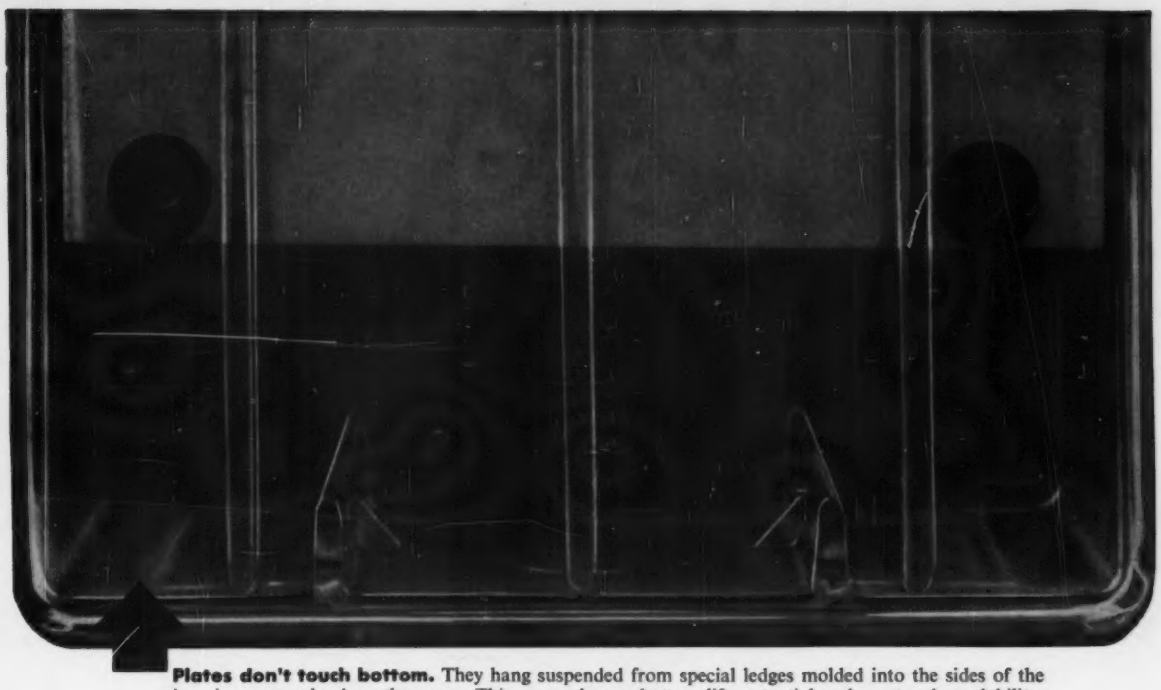
EMPLOYMENT OPPORTUNITIES 208

EQUIPMENT
(Used or Surplus New)
For Sale 208



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Contractors were judged on a definite point system. City and county electrical inspectors cooperated by checking the wiring installed and mailing a checkoff card to the utility. Final results were so close that both first and second prize winners were awarded the Nassau trip.

"Contests such as this show that a huge reservoir of HOUSEPOWER business is just waiting to be tapped by aggressive, foresighted utilities," says Perry Green, Kuhlman Electric Company sales manager.

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